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Bhoja Rájá of Dhár and his Homonyms.—By BÁBU
RÁJENDRALÁLA MITRA.

The name of Bhoja Pramára is the most celebrated in the annals of India. It stands pre-eminent as the emblem of a glorious sovereign, a distinguished author, and a noble patron of learning; and our poetry, our romances and our nursery tales have alike selected it as the theme of their laudations. It is remarkable, however, that little seems to be known of the identity of the individual who gave it such greatness. "While Hindu literature survives," said Col. Tod, "the name of Bhoja Pramára and the 'nine gems' of his court cannot perish," and yet at the time the learned historian of the Rajputs had three claimants before him, every one of whom asserted his right to the glories of the Bhoja Pramára, and he was obliged to admit "that it is difficult to say which of the three princes was the greatest, as they all appear to have been distinguished patrons of science and literature." Since his time the researches of Indian antiquarians have brought to light more than a dozen princes who have, at different times, borne that illustrious name, but whose history is shrouded in mystery which legendary tales, in the absence of authentic evidence, cannot solve. It may not be uninteresting, therefore, to ascertain and bring together the sum of our knowledge regarding the several monarchs of the name of Bhoja that have been from time to time met with. It might, to some extent, help to remove a prolific source of error to many hasty antiquarians who frequently jump into conclusions regarding the age of undated—and not rarely of dated—inscriptions from the mere circumstance of the word Bhoja occurring in them.

The derivation of the word may be traced to the root *bhuj* 'to enjoy,' and in that sense it has been used by the Brahmans from the remotest antiquity. In the third book of the Rig Veda Sañhitá (Chap. III. Varga 20, verse 7) it occurs for the first time as a generic term* to indicate the sacrifice-loving Kshetria sons of Sudása, which fact argues the likelihood of some one of them having borne that word as his specific name. Subsequently we find it in the Mahábhárata,† many centuries before the commencement of the Christian era, as the title of a king who was the foster father of Kuntí, the mother of the renowned Pándavas. He was a cousin (father's sister's son) of S'ura and generally known by the name of Kuntí Bhoja. S'ura, was the father of Vasudeva and Prithá; and the latter when made over to her cousin-german assumed the name of Kuntí.

Immediately after him we meet with a Bhoja in Col. Wilford's "Essay on the sacred Isles in the West,"‡ who was a vassal of Jarásandha. He invited the Magas to his dominion on the banks of the Ganges, and gave his daughter to one of them from whom descended the eighteen families of the Bhojakas. I cannot, however, find any mention of this prince in the *Sám̄ba Purána* to which the Colonel refers his readers, and feel disposed, therefore, to attribute his origin to the imagination of the Colonel's Panditas. His contemporaneity to Jarásandha would make him a contemporary of Vasudeva and Pándu, and consequently of Kuntí Bhoja, with whom he was most probably identical. His country is called *Karac desa*.

The Colonel has a second prince of this name§ who was a relative and friend of Krishna and chief of the town of Bhojapura. This must have been either Kuntí Bhoja himself, who was a cousin of Krishna's father, or a descendant of his who assumed the patronymic of Bhoja. I feel disposed to take the latter alternative, as in the Mahabharata,|| a Bhoja of Bhojapura in Behar, not Kuntí Bhoja, appears in the company of Aswatthámá as a rival of the Pándava brothers for the hand of Draupadí, which would scarcely be probable

* The words are *Ime Bhojá āṅgīraso virūpá*, which Śāyana explains by *Ime jāgam kurvānāh Bhojāh sauśāsāh kshatriyāh teshām yājakāh virūpá nānā rūpā Medhātithi prithitayo āṅgīrasascha*. Max Müller, Vol. II. p. 928.

† *Ādi Parva*, chapter III. Vol. I. p. 161, Calcutta edition.

‡ *Asiatic Researches*, Vol. XI. p. 82.

§ *Loc. cit.*

|| *Ādi Parva*, Vol. II. p. 253, v. 6986.

अश्वत्थामा च भोजस्य सर्वशस्त्रगतां वरौ ।

in the case of Kuntí Bhoja himself, the maternal grandfather of those Pándavas. The dominions of all the three are placed on the banks of the Ganges in Magadha or its neighbourhood. The capital of the last, *Mrittikavatí*, was situated on the river Karmanásá which Wilson supposed to be near the modern Bhojpur.

Next to these we come to a Bhoja Rájá who is made to reign 127 years from about B. C. 180 to B. C. 53. He was, according to the Orissan chronicles, "a brave, liberal, just and merciful prince. His court was adorned by the presence of 750 eminent poets, the chief of whom was Kálidása, author of the 752 slokas called the *Chának* or *Chátaka* and *Mahá Nátaka*. This Rájá Bhoja invented boats, the weaver's loom, and wheeled carriages, or at least in his time the use of them first became common. In this reign the Yavans from Sindhu Des invaded the country in great force, but Bhoja discomfited and destroyed them, and afterwards captured many of their possessions and cities. He was followed by Vikramáditya who was either a brother or a son of his."* The bungling here of a Bhoja before Vikramáditya of the Samvat era, of Vikramáditya himself, and of the Bhoja of the 10th century, is self-evident and needs no comment. A Bengali romance named *Bhánumatí* makes a Bhoja the father-in-law of Vikrama.

No monumental evidence exists of any of these five princes, and they are interesting only as affording a strong proof in favour of the antiquity of their name. The last two, namely, those of the Orissan chronicles and of *Bhánumatí*, appear to be entirely mythical. I may say the same of three sovereigns of Bengal whose names occur in Pere Teiffenthaler's history of Orissa.† Two of them, viz. Rájá Bhoja with a reign of 75 years, and Samat Bhoja with a reign of 48, are said to have belonged to the family of Gor, and the last, Rájá Bhoja, of a Káyastha family, who reigned 70 years, was the third in descent from Pratóparudra.‡ Their names are so mixed up with those of the kings of Orissa, and so overcast by a misty atmosphere of fable, that they can claim no attention from the sober historian. Most of the reigns given by the Reverend Missionary, range from 70*to 108 years.

* Sterling's History of Cuttack, Asiatic Researches, Vol. XV. p. 259.

† Description Historique et Geographique de l'Inde, Vol. I. p. 472.

‡ Sterling's list has (1) Pertapa rudra (1502 A. C.), 2, Govinda Rao (1524), 3, Narasiñha Janna, (1539), 4, Mukunda Deo, (1550).

Passing them over we came to the first Bhoja whose era may be ascertained with some certainty. Col. Tod, following a Jain manuscript,* says that he flourished about the end of the sixth century, S. 631 = A. C. 575. He was a sovereign of the Pramára race and had Málava for his dominion. Abbe Bertrand,† following Mir Ali Afsos, makes a Bhoja ascend the throne of Málava 542 years after Vikramáditya, which would give us a Bhoja a century before this sovereign; and Teiffenthaler gives another 426‡ years after Vikrama, both of whom are probably the same with the first prince of Tod, misplaced by blundering chroniclers. Prinsep,§ following the Ayin Akbary, places Bhoja the successor of Munja at the end of the 5th century (483) whom he identified with the first Bhoja of Tod.

The next Bhoja of the Colonel's list lived in Samvat 721 = A. C. 665. According to the Aitpur inscription,|| a Bhoja was the son of Goháditya and the seventh ancestor in a direct line from a sovereign of the name of Kála Bhoja "a hero resplendent as the sun," who was followed after eight successive generations by a Sakti Kumára who flourished in the Samvat year 1034 (16th of Bysakha) = A. C. 978. Col. Tod assumes the first of these two to be identical with his second Bhoja. Now ascending from Sakti Kumára if we allow eighteen years to each reign,¶ Kála Bhoja would be placed in the middle of the 9th century (A. C. 834) and Bhoja in the early part of the 8th century (A. C. 708) instead of the middle of the seventh agreeably to the Jain date. This discrepancy, however, may be reconciled if we allow the first Bhoja a reign of a little more than forty-three years from A. C. 665 to 708, or a little longer than an ordinary reign to one of his successors. It is probably this prince who is described as the elder or VRIDDHA BHOJA at whose instance Bána the poet propitiated the sun by a poem of great merit, the *Súryas'ataka*, and rid himself of leprosy; and it is possibly to him we owe the treatise on rhetoric entitled *Saraswati-kant'hábharaṇa*

* Tod's Rajasthan, Vol. I. p. 800.

† Journal Asiatique, Mai 1844, p. 354.

‡ Description Historique et Geographique de l'Inde, Vol. I. p. 1.

§ Thomas's Prinsep, Vol. II. p. 250.

|| Tod's History of Rajasthan, Vol. I. p. 802.

¶ The genealogy of the fifteen princes of this line runs as follows: 1, Goháditya; 2, Bhoja; 3, Mahendra; 4, Nága; 5, Syeela, (Sailya?) 6, Aparájita; 7, Mahendra; 8, Kála Bhoja; 9, Khoman; 10, Bhirtripada; 11, Singji; 12, Sri Ulut (whose daughter's son) 13, Nirváhana; 14, Saliváhana; 15, Sakti Kumára.

and one or two other works which pass in the name of a Bhoja Rájá.* He was the contemporary of Mánatungas'uri and of Maura the poet. If he be admitted to have been the patron of Bána, it would require little proof to shew that he was a great patron of learned men and was surrounded by a number of poets and literati, and that without pledging our faith to the apocryphal five hundred scholars of his court. Our information, however, regarding Vriddha Bhoja is yet so meagre and unsatisfactory that it would be unwarrantable to assume, farther than as a mere conjecture, his identity with the second Bhoja of Col. Tod. The expression Vriddha (old) would suit the first Bhoja best, but the date of Bána would not justify the assignment. The Bhoja and Kála Bhoja of the Aitpura record have their counterparts in an inscription from Mount Abu noticed by Professor Wilson, but instead of being nine generations removed from each other, there they appear as father and son. Judging from this circumstance and the fact of the names of their ancestors for two generations and of their successors for twenty generations being different throughout, we have no hesitation in taking them to be quite distinct. They were Jains and belonged to the solar race of Mewar.† The last of the roll lived in A. C. 1286, which with the usual allowance of eighteen years to each reign would place Bhoja in the beginning of the tenth century (A. C. 908).

Kshiraswámin of Káshmir (A. C. 772) cites a Bhoja as the author of a vocabulary and a grammar;‡ but the editor of the *Vásavadattá* “does not feel it necessary to believe that in every instance Bhoja is the name of a king,” and I am disposed to side with him.

The third Bhoja of Col. Tod's list is the hero of the *Bhoja-prabandha* and sovereign of Dhára. Before I notice him it is necessary, for the sake of chronological order, to record the names of two sovereigns of Kanouj and one of Peheva. The first two occur in a copper plate inscription§ found by the late Col. Stacy, a counterpart

* Colebrooke's *Miscellaneous Essays*, Vol. I. p. 22.

† *Asiatic Researches*, XVI. p. 291 et seq. The names are—1 Bappáka, 2 Gohila, 3 Bhoja, 4 Kála Bhoja, 5 Bhartribhaṭṭa, 6 Samahaṣika, 7 Khunmána, 8 Allata, 9 Naraváhana, 10 Sakti—? 11 Suchivarma, 12 Naravarma, 13 Kirtivarma, 14 Vairi Siṅha, 15 Vijaya Siṅha, 16 Ari Siṅha, 17 Vikrama Siṅha, 18 Samat Siṅha, 19 Kumára Siṅha, 20 Mathana Siṅha, 21 Padma Siṅha, 22 Jaita Siṅha, 23 Teja Siṅha, 24 Samara Siṅha.

‡ Colebrooke's *Miscellaneous Essay*, Vol. II. p. 290.

§ Vide my translation of this record, ante, Vol. XVII. p. 71.

of which has lately been found by Mr. Cosserat at Sarun.* Col. Stacy's inscription bears date the 65 (?) of Vaishakha of a local era and records the grant of a village named Tikkarika which was situated on the left bank of the Ganges opposite Benares. The donor's name is Vináyakapála. His ancestors, who begin their genealogical tree with a Devas'akti, include a Bhoja son of Ramabhadra, and another son (?) of Mahendra Pála. In a paper entitled "Vestiges of three Royal Lines of Kányakubja or Kanouj,"† allusion has been made to a huge inscription at Gwalior which has the name of a Mahendra Pála with the date 960 close by it, then a Bhoja, and then again a Mahendra Pála with the date 964 after it; but as the transcript from which this information has been gleaned is described to be "full of breaks, the very perfection of all that is unintelligible, and the result of laborious infidelity in which the copyist had in patches by the dozen altered as many as eight or ten consecutive letters," I do not feel that it would at all subserve the purposes of history to attach any importance to these dates, until an authentic transcript of the record is available for reference. Colonel Cunningham probably refers to this monument in his letter of the 30th September, 1860 (Ante XXIX. p. 395), in which he makes mention of a Mahárajá Bhoja Deva in Gwalior. If my reading of the date of the Sarun plate, which I offer as a mere conjecture, be correct, the dates of Devas'akti's descendants at eighteen years per reign would be

1 Devas'akti,	A. C. 779
2 Vatsarája,	A. C. 791
3 Nágabhāṭṭa,	A. C. 814
4 Ramabhadra,.....	A. C. 832
5 Bhoja,	A. C. 850
6 Mahendra Pála,	A. C. 868
7 Bhoja,	A. C. 885
8 Vináyaka Pála,	A. C. 900

Should the data upon which my dates are founded be not deemed satisfactory, and the dates therefore not acceptable, still the Bhojas of Devas'akti's dynasty will not be confounded with the great sovereignty of Dhárá. When Professor Wilson wrote his paper on the history of Káshmir, he knew of only one Bhoja between the tenth

* My note on this record was read before a meeting of the Asiatic Society held on the 2nd of July, 1862. It is likely to be published in the volume for this year.

† Ante, Vol. XXXI. p. 6.

Handwritten text in Arabic script, likely a manuscript page, showing dense, cursive writing across multiple lines. The text is oriented vertically in the image.



and the eleventh centuries, and he accordingly made Sañkaravarma of Kashmir in the beginning of the tenth century (904 to 920) subvert the extensive empire of the sovereign of Dhárá, and solved the anachronism which this involved by stating that "we need not expect, however, extreme accuracy in this matter, and may rest satisfied with considering it as an approximation to the truth and generally as an additional testimony of Bhoja's having flourished early in the tenth century." Had he the Stacy record before him he would have found two names of an era which would have completely obviated his anachronism.

The second of these princes I assume to have been identical with the sovereign named in an inscription on a Vaishnavite temple at Gwalior. He is described as a "Lord paramount" who flourished in A. C. 876. His genealogy is not given, but the date of his reign and the fact that the sovereigns of Kanouj about that time did exercise paramount power over Gwalior, justify the assumption.*

The Bhoja of Pehewa occurs in an inscription recorded on the side of a temple in a village on the banks of the Saraswatí fifteen miles west of Thaneshwar.† The record is very imperfect, having many lacunæ and large breaks at the beginning and end of every line, but from what remains a list of ten names have been made out as follows :

- I. Mahendra Pala.
- II. Jaṭula.
- III. ? (illegible).
- IV. Vajraṭa.
- V. Yájnika.
- VI. Sogga.
- VII. Purna.
- VIII. Devarája.
- IX. Rámachandra.
- X. Bhoja.

The date of the last on the inscription is unmistakably Samvat 279. The facsimile where it is given, happens to be perfectly clear, and the letters are so well formed that there cannot be the possibility of a mistake in the reading. But the circumstance of a Bhoja at so early a date misled me as to his identity, and those who have since attempted to correct me have been equally misled. Col. Alexander

* Vestiges of the Kings of Gwalior, ante Vol. XXXI. p. 397.

† Vide my note on an inscription from Thaneshwar, ante, Vol. XXII. p. 673.

Cunningham, an authority of great eminence in all matters connected with Indian antiquities, was the first who noticed my mistake, but by taking a misprint in my paper in which 179 is, in one place, put for 279, he was led to suppose that a small cypher after the first figure had escaped me and the date was really 1079. The actual date being 279 a cypher after the first figure would give us Samvat 2079, which would carry us nearly a hundred and sixty years into futurity. The Colonel, however, subsequently changed his opinion as regards the cypher and said "the inscription is beyond all doubt, a middle age one, that is, the forms of the letters are those of the eleventh and twelfth centuries; I read the date 1190 S. or 1133 A. D."* Mr. E. Thomas entirely concurred in this reading, and the learned Professor Weber, in the *Zeitschrift* of the German Oriental Society,† in commenting upon my paper, supposed with Col. Cunningham that either I must have overlooked a cypher after the first figure which he imagined existed and that the date was 1079, or the era used was other than that of the Samvat of Vikramáditya. None of my critics thought it worth his while to look to the genealogy of the prince named. It may appear strange that such distin-

* *Ante*, Vol. XXIV. p. 243.

† Vol. IX. p. 629. I translate the Professor's remarks for easy reference. "A very fragmentary inscription, bearing date Babu Rajendra Lal, in the face of the doubts hitherto entertained on this subject, draws hence the bold conclusion, that Bhoja lived A. C. 122 (he reads here Samvat 179; but the text, p. 676 has 279). As unfortunately no facsimile has been added (a great mistake, the writing alone furnishing the safest starting point) we think ourselves justified to doubt the correctness of the reading, which, even as it stands, fluctuates between 179 and 279. The time of Bhoja, however, by Lassen's excellent examination (*Zeitschrift der Kunde des M.* VII. 345) of the Nagpore inscription (J. Bombay B. of the R. A. S. 1,254) has been clearly defined, viz. the close of the eleventh and the commencement of the twelfth Samvat century. The special supposition of Lassen, that the 55½ years of his reign, as given by tradition, fall between Samvat 1093-1149 (A. D. 1037-1093) is chiefly based on the year of the death of one of his successors, viz. of Naravarmadeva, which Colebrooke (*Misc. Ess.* II, 298-303) fixed at Samvat 1190, as according to one inscription the anniversary of his funeral rites took place Samvat 1191, (maharajas' rinavarmadeva samvatsarika). From these words, however, only this follows, that he must necessarily have died at the latest Samvat 1190, but this does not exclude the possibility of his having died several years before. With reference to our inscription there is only one alternative, either the reading is 1079 (the small circle of the zero could easily escape observation), or, however improbable, the Samvat calculation differ here from the common one. In the first case, which I would approve of, Bhoja would have reigned already 1079 (A. D. 1023), and this being correct, Tod's conjecture, that the temporary expulsion of Bhoja, mentioned by tradition, was perhaps connected with the inroad of Mahmud of Ghuzni, who conquered Guzerat in the year 1024-26,—a conjecture which was attacked by Lassen,—would have been corroborated."

guished antiquarians as Col. Cunningham and the Professor Weber, to whom oriental scholars are so deeply indebted for their varied and most interesting researches into the past history of India, should, from a mere identity of names, infer the identity of persons, and yet the extracts quoted above shew that both of them found the name of a Bhoja in the monument under notice and per saltum came to the conclusion that it was that of Dhárá, overlooking altogether that the last princee was the son of Sindhula and grandson of Sindhu,* whereas the potentate named in the record before them was the son of Rámachandra and grandson of Devarája. One of the Kanauj Bhojas was the son of a Rámabhadrá,† but there is nothing to shew that Rámabhadrá was an alias of Rámachandra, and their ancestors are quite different. Leaving aside, therefore, the question of date, the reading of which has been doubted, the bare fact of the two princees being descended from separate parents ought to leave no doubt of their having been different individuals, born, all but positively, at different periods.

As to the date of the potentate named in the Thanewar record, the facsimile now published will shew as clearly as possible that it is 279 Samvat. If I assume with my critics that a cypher after the first figure has been overlooked or accidentally omitted by the engraver, a circumstance not very likely and yet not quite impossible, for engravers are liable to err, though not quite so often as copyists, the date will be 2079 which will carry the era of the princee, as aforesaid, nearly a hundred and sixty years into futurity. To assume a 1 before the first figure, would be a guess at random which can claim no confidence. The writer in the *Zeitschrift* quoted above, suggests the possibility of the Samvat alluded to in the record, being other than that of Vikramáditya; but we know of no Samvat which can be adopted with perfect propriety. Next to the era of Vikrama, the Samvat of Ballabhi was the best known in Malwa, and its zero being 318 A. C.‡ our date would be $318 + 279 =$ A. C. 597, which would be too early for the style of the characters in which the record is incised. The Samvat of the Sena Rajas of Bengal§ commenced in

* Madhukarghar inscription, *Transact. Royal Asiatic Society, London, Vol.*

I. p.

† *Ante, Vol. xvii. pt. I. p. 72.*

‡ *Thomas's Prinsep, Vol. II. p. 158.*

§ *Ditto do. p. 272.*

the year 1063 A. C. which, if assumed to be the era of the inscription, would place our Bhoja at the end of the thirteenth century when Thanesar and its neighbourhood were entirely in the hands of the Mahomedans. The same may be said of the Sivasinha Samvat* of the Gohils of Deo the zero of which corresponds with 1112 A. C. No other Samvat era is known to have been current, unless it be purely a local or a family era, which is very likely, but in that case there is no easy prospect of our coming to a solution of the difficulty. A Bhoja Deva was king of Lodorvat in 1160 A. C. who would have nearly corresponded with the prince of Pchewa by assuming the first figure of our date to be 1 and the reading the second figure to be also 1 and not 2, thereby making the whole 1179 Samvat as supposed by Col. Cunningham, but unfortunately he was the son of Berjrae and not of Rámachandra. The same genealogical difficulty prevents our identifying him with the Rao Bhoja of Harouti, who was the son of Soorjun, and a contemporary of Akbar‡ (A. C. 1575).

The style of writing is generally appealed to as a chronological guide in cases where the reading of the date is doubtful. This undoubtedly is a good test to some extent; but Dr. Weber carries it too far when he assumes that in a case where the date fluctuates between 179 and 279 the style of writing may be allowed to settle the difference. This can scarcely be the case, except in very modern writings and at certain turning points; and even then it takes a much longer time than a century for one peculiar style of writing to pass so markedly into another as to afford a conclusive evidence of age; and this without adverting to local and individual peculiarities which so materially affect its uniformity. Nothing is more common than a single style of writing spreading over two or three centuries, or predominating in certain regions while it is dying out in others. The history of the Roman character in different parts of Europe during the last century affords a singular instance in point. James Prinsep, who was the first to devise a system of palæographic chronology for India§ in which the style of writing was taken as an index to the age of the document in which it was found, was fully sensible of the fact, and he accordingly assigned a range of three centuries to his No. I. or Lat cha-

* Thomas's Prinsep, Vol. II. p. 158.

† Tod's Rajasthan, Vol. II. p. 242.

‡ Tod's Rajasthan, Vol. II. p. 475.

§ Ante, Vol. VII. p. 276, plate XIII.

acters, and of four centuries to No. IV. of the Guzerat plates. He could not intend his table to be other than tentative and open to considerable corrections and modifications, for it is impossible to believe that with the limited data before him in regard to a subject which had never, before his time, had the benefit of any scientific enquiry, he could be so far satisfied as authoritatively to lay down each particular set of characters to one well defined period which would not admit of either extension or contraction. The so-called *kuṭiḷa* or the "crooked" characters which, according to Col. Cunningham, owes its name to a mislection of the word *kumuda* or the "lotus like," was marked by Mr. Prinsep against the tenth century; but he did not by any means intend that it should be confined to that century alone, for he had himself translated several records of the eleventh century in that character. I have since noticed an inscription from Buddha Gayá* in which the *Kuṭiḷa* is associated with the Samvat date 781 = A. C. 726. This would give a range of four centuries, but as it is not to be supposed that the *Kuṭiḷa* had just been formed when it was used in the Buddha Gya monument, we may fairly give it an additional fifty, eighty or even a hundred years. No doubt there are peculiarities of certain forms and archaisms which to a practised eye distinguish the earlier from the later *Kuṭiḷa*, but they are of no value whatever in cases where the difference is not greater than a century. The character of the Thanewar monument is the *Kuṭiḷa* without any marked archaisms or tendency to merge into the modern Devanágari, and judging from it, one may be fully justified in placing it in the ninth, tenth or eleventh century according to his choice. The archaic character of some of the names *Jaṭula*, *Vajraṭa*, &c., would carry us to the earliest period of the *Kuṭiḷa* range, but under no circumstance to the third century of the *Vikramáditya* era, to which the date would bring us.

The discrepancy between the date and the style of writing, therefore, can be solved only by supposing, as I have already said, the Samvat of the date to be a local or family era utterly unconnected with *Vikramáditya*; and if this be admitted, our prince will be left to occupy a place in the *Kuṭiḷa* period which, until future research settles it more definitely, must enjoy a range of near three centuries.

* Ante, Vol. XXVII. p. 74.

The last sovereign on our list is the great Bhoja of Dhára.* According to the legendary accounts of the *Bhoja-Provandha*, the *Bhoja-Champu* and the *Bhoja-Charita*, he was the son of Sindhula, the grandson of Sindhu and the immediate successor of Munja. His country, Málava, was an ancient and renowned seat of learning, and his people were noted for their refined manners and high civilization. Hiouen-Thsang, who visited the place in the seventh century, says “les habitants des province sont d’un caractère douz et poli, et ils aiment et estiment la culture des lettres. Dans les cinq parties de l’Inde, * * * ce pays et celui de Magadha, sont les deux seuls royaumes dont les habitants se fassent remarquer par l’amour de l’étude, l’estime pour la vertu, la facilité de l’élocution et l’harmonie du langage.”† Kálidasa, on a much earlier date, sang of its glories in more than one of his immortal works.

Munja, according to Ballála‡ the author of the *Bhoja-Pravandha*, was the younger brother of Sindhula who bestowed the kingdom upon him in supercession of his son who was then only five years old, and utterly incompetent to assume the cares of state. The *Bhoja-Charita* contradicts this statement and makes Munja a foundling who was brought home by Sindhu to be nursed by his wife Padmávati. Sindhu, says the fabler, was out on a hunting expedition, and when alone on the bank of a river found on a tuft of Munja grass, (*Saccharum munja*, Rox.) a new-born babe, which he brought home and reared up under the name of Munja. The two biographers agree in giving Bhoja a long and prosperous reign of fifty-five years, seven months and three days, interrupted only for a short period when a *jogi* or mendicant, under pretence of teaching him the art of transferring one’s soul from one body to another, sent the king’s soul to animate the body of a parrot and himself entered the king’s body and reigned in his stead. An accident enabled Bhoja, through the intervention of Chandrasena of Chandrávati, to regain his mortal coil from the usurper, and he died a natural death, leaving his kingdom to his adopted son Gajánanda.§ The latter was childless, and with

* The *Rája-mártanda* gives Ranarangamalla as an *alias* of this Bhoja.

† Histoire de la vie et des voyages de Hiouen-Thsang, p. 204.

‡ Vallabha Pundit according to same MSS. His time has been supposed to have been A. C. 1340. Mons. M. Pavie has published a translation of this work in the Journal Asiatique for March, April, 1844, p. 184, *et seq.*

§ The name has been differently given in different places.

him, therefore, ended the glory of the Pramára race at Dhára. Chaitan Pála, a great zemindar of the Tuar lineage, was elected the successor of Gajánanda, and his descendants reigned in Dhára for 214 years.

With the exception of the period of Bhoja's reign the whole of these statements have been questioned. The story of Munja's birth is purely mythical, designed more to account for the origin of his uncommon name than to narrate sober facts. Professor Lassen* is of opinion that Munja was really the uncle of Bhoja, and that he came to the throne by usurpation when his brother Sindhula, or whatever else was his name, was away from his capital on an expedition to the South. This may be to some extent inferred from the story which says that once when an astrologer foretold that Munja would take the kingdom from his brother, Sindhula ordered Munja to be beheaded and subsequently, repenting of his rash command, made his sceptre over to him, and retired to the South to found a kingdom of his own. The story of the *jogi* and his metempsychosis may likewise be set down to pure invention, or a poetical euphism for either a revolt at home or an invasion from the north which compelled Bhoja to fly from his kingdom for a time; and the accounts of his death and successors have been controverted by the testimony of authentic inscriptions recorded by his descendants.

The parentage of Bhoja, as given by his biographers, has the support of an inscription found by Col. Tod at Madhukarghar in Harouti,† but it differs from the biographers in giving the succession of Bhoja to a relative, Udayáditya, whose descendants occupied the throne of Dhára for several generations.

A second inscription from a temple on the west bank of the Weyne Gangá near Nagpur, decyphered by Pandit Ball Gungadhur Shástri of Bombay,‡ gives a different genealogy. According to it, the founder of Bhoja's family was a Vairisinha of the Pramára race, who was followed by his son Bhimaka. Bhimaka was succeeded by Rájá Rájá or Bhoja Rájá, and he by his younger brother Bhadra Rájá. Bhadra was the father of Bhoja Rájá, and Bhoja left the kingdom to his son Udayáditya, whose son Naravarmadeva recorded the inscription. To

* Zeitschrift für die Kunde des Morgenlandes, Vol. VII. p. 345.

† Transact. R. As. Soc. Vol. I. p. 226. It records the names of Sindhu, Sindhula, Bhoja, Udayáditya and Naravarma.

‡ Journal Bombay B. R. A. Society, No. VI. p. 259.

reconcile this statement with that of the Madhukarghar monument was found impracticable, and it was accordingly suggested that the latter may be cast overboard as well as the *Bhoja-Pravandha* and the *Bhoja-Charita*, inasmuch as we possess but a very imperfect paraphrase of it, and that prepared by an untrustworthy interpreter. The interpretation of the Nagpur record, however, has since been found to be even more untrustworthy than the paraphrase of Col. Tod's pandits, and its roll of names to be in more than one instance quite illusory. This was pointed out by Professor Christianus Lassen in his notice of a copper-plate inscription brought from Sattara and decyphered by him.*

The legend of the copper plate is, allowance being made for the Shástri's errors, an exact counterpart of the stone tablet at Nagpur, and hence it has been supposed that the plate had been originally deposited in the same temple upon the portico of which the stone is affixed, and that it was subsequently removed to Sattara, most probably, by the Marhattas, though the when and the why cannot now be satisfactorily ascertained. No facsimile of the document has yet been published, but from the satisfactory state of preservation of the original and the scrupulous care with which the Professor has examined it letter by letter, there can be no question as to its authenticity or of the general accuracy of its interpretation.

It opens with a salutation to Saraswatí, and after recounting the origin of the Pramára race, states that in it was born a king of the name of Vairisiñha, "who ruled the earth, shaming Indra in heaven by his prosperity." His son and successor Siyaka had two children, Munja and Siñharája, of whom Munja the eldest succeeded his father. How Munja died, the record explains not, but after describing the might and heroism of his brother Siñharája, makes his son Bhoja Rájá assume the sovereignty. This Bhoja† is no doubt the great king of the *Bhoja-Pravandha*, but his panegyrist has nothing to record of him besides a few unmeaning platitudes about great victories, unrivalled heroism, and so forth. No mention whatever is made of his "nine gems," nor of the encouragement he offered to

* *Zeitschrift für die Kunde des Morgenlandes*, Vol. VII. p. 194.

† The Bediyas or Gypsies of India hold a Bhoja to be the founder of necromancy and jugglery, and the Bengali romance, *Bhánumatí*, supports the idea. The common name of conjuration in Bengali is Bhojabáji or the feats of Bhoja, but no mention of it has been met with in any Sanskrit work.

learning and learned men, although the *Bhoja-Prabandha* devotes three-fourths of its space to recounting the names of the several poets who graced his court and to choice selections from their compositions, and it is all but certain that the *Rájamártanda* and the commentary on the Yoga aphorisms which pass in the name of a Bhoja, owe their origin to his patronage. On the death of Bhoja, the country, says the inscription, was overrun by enemies, and anarchy everywhere reigned supreme, until at last a kinsman (*Bandhu*)* of the name of Udayáditya assumed the sovereignty and brought peace and prosperity in his train. Laksmadeva the son of Udayáditya was a mighty prince. He stretched his arms over all India, and his conquests, says the chronicler, extended from Gour in the east to Balkh beyond Affghanistan, and from Mainak on the Himálaya, to Ceylon in the south; the countries especially named being Gour, Añga, Kaliñga, Tripura, Chola, Pándya, Ceylon, Mainák, and Balkh on the Oxus. Much of this no doubt is attributable to poetical hyperbole, for it is not at all likely that Lakshmadhara, a mere duke as he was, did wage war against Mádhava Sena, the Vaidya king of Bengal, who erected pillars of victory even in Central India, or proceed so far as Cabul to give battle to the Gaznavides in their own country. The centre of northern India was at his time held by the Pálas of Kanauj and they were not likely to fall a prey to the rapacity of a vassal. His conquests in Chola, Pándya and Tripura may be facts, but they must have been of an ephemeral character.

The Ujjayiní plates decyphered by Colebrooke,† makes no mention of Lakshmadeva, but carries the succession from Udayáditya successively to Naravarmadeva, Yasovarmadeva and the two sons of the last, namely, Jayavarmadeva and Lakshmívarmadeva. The Sattara plates call Lakshmadeva, the brother of Naravarma, and assign to the latter sufficient power to commute a grant of two villages made by

* By a mistaken estimate of the first word in the following extract a writer in the Journal of the American Oriental Society has been led to call Udayáditya the son of Bhoja.

ततोऽभूदुदयादित्यो नित्यात्माहैककौतुकी ।
असाधारणवीरश्रीहेतुर्विरोधिनाम् ॥

J. A. O. S. Vol. II. p. 29—35, Vol. I. p. 517.

The Nagpur inscription has the word *Bandhu* though the decypherer read it *átmaya*. Probably the same cause led the interpreter of the Madhukarghar inscription to call him the son of Bhoja.

† Miscellaneous Essays, Vol. II. p. 297.

the former into one of one village, and make Lakshmadeva acknowledge it as a matter of course. It may hence be inferred that Naravarma was the immediate heir and successor of Udayáditya in Malwa, and that his brother held an appanage to the south of the Vindhya, having Nagpur for its capital. Probably he was a governor of the southern provinces during his father's lifetime and subsequently retained them for himself, in vassalage to his brother.* Professor Lassen supposes that he must have revolted against his brother, by whom he was overcome and expelled the country, and hence it is that he names Naravarma in the inscription without any praise. We think, however, that had such been the case, he would have scarcely thought it necessary to advert to the revocation of his grant by his brother in a document intended only to record the glories of his family, and his dedication of a temple to his god-elect.

But however that be, certain it is that he was a son of Bhoja's successor Udayáditya, and lived at the beginning of the twelfth century, and this being the case, the question arises, is the Bhoja of the Sattara inscription identical with the sovereign of that name noticed in the Madhukargarh record and the *Bhoja-Prabandha*? or is he different? The two last authorities concur in giving the same genealogy and evidently intend to describe the same prince. It is true the *Bhoja-Prabandha* names Munja, who does not appear on the Madhukargarh tablet, but as the object of the latter was only to give the lincal ancestors of Bhoja Rájá, the omission is not a matter of any consequence, inasmuch as Munja was only an uncle of Bhoja, and could not therefore be included among his direct ancestors. The Sattara and the Nagpur inscriptions name Munja as the immediate predecessor of Bhoja, and therefore may be supposed to allude to the hero of the *Bhoja-Prabandha*, but it makes Munja the son of Siyaka and Bhoja that of Siñharája. This discrepancy is farther confounded by an inscription from Ujjayiní decyphered by me in 1850,† and another found at Indore and published in the last volume of the Journal,‡ both of which make a Krishnarája to be the first of a line

* Zeitschrift für die Kunde des Morgenlandes, Vol. II. p. 340.

† Ante XIX. p. 475. The conjecture thrown out there regarding the succession of Vákpati is untenable.

‡ Ante XXX. p. 195. Mr. Hall, with his wonted predilection for microscopic criticism, complains in this paper, as elsewhere, of Colebrooke's imperfect translations of the imprecatory verses in the record, and supplies new versions of some under the apology of more than one of their number having been "repeated."

of kings of Malwa, the second of which was a Vairisiñha, the third a Siyaka, and the fourth Vákpatirāja *alias* Amoghavarsa, *alias* Vallabhanarendra. The last made a grant of land at Ujjayiní in the year of Samvat 1031 = A. C. 974, and subsequently another in Samvat 1036 = A. C. 980, just when, according to the Sattara record, the capital of Malwa must have been in the hands of Munja or his immediate predecessor. Here, it is true, we have the Vairisiñha of the Sattara plate, but his son Siyaka is followed not by Munja but Vákpatirāja whose alternative names were Amoghavarsha and Vallabhanarendra. To solve this difficulty, it has been suggested that the Siyaka of the Sattara, Ujjayiní and Indore plates is but an *alias* of the Sindhu of the Madhukargarh monument and the *Bhoja Prabandha*, and that Munja is but a nickname of Vákpati *alias* Amoghavarsha; Sindhula being the *alter ego* of Siñharāja. It must readily be admitted that there is little to justify these assumptions, and it is hard to conceive that grave monumental records and title-deeds of real property should so name the same individuals as not be recognisable without assuming far-fetched aliases, and yet the identity of time and place mentioned, leaves us no alternative. The Krishnarāja of the Indore and Ujjayiní plates could not reign at the last named place simultaneously with the descendants of the Vairisiñha of the Sattara plates, and we must therefore either admit that they were identical, or assume one of the two lines of kings to be mythical. The last is impossible, as we have to deal with donative records of undoubted authenticity.

That those records allude to the same time it is not difficult to shew. The Sattara inscription of Lakshmadeva bears date 1161 Samvat = A. C. 1104. His brother Naravarma was succeeded in Malwa by his son Yasovarma who celebrated the anniversary of his father's death on the 8th of the waxing moon in the month of Kártika S. 1191 (A. C. 1135) by the donation of two villages to a Brahman of some sanctity. This grant was subsequently ratified by his son Jayavarma on the 15th of the waxing moon in the month of Srávana S. 1200 = 16th July, A. C.

edly misinterpreted;" but unfortunately for his predecessors he frequently misinterprets where they were correct. One notable instance of this occurs at page 210 where "unsteady as a drop of water on a lotus leaf" of Colebrooke having been converted into "uncertain as a bead of water on the petal of a lotus," the idea of unsteadiness has been entirely lost; since it is only on the leaf of the lotus that water is tremulous and not on its petals.

1144.* Colebrooke supposed that Naravarma must have died in Samvat 1190, or otherwise his son could not celebrate the anniversary of his funeral in the year following. This, however, is not necessarily the case; for the *sāmvatsarika* or anniversary *shrāddha* is an observance which recurs every year, and therefore allusion to it implies any time beyond eleven lunisolar months and twenty-nine days; no matter whether it be one or many years.† Allowing for this uncertainty a range of only ten years, this much may be taken for granted that Naravarma died between 1180 and 1190 Samvat. Now if we allow him a reign of twenty-five years and a short one of fifteen to his father Udayāditya, the close of Bhoja's reign will be placed between 1140 and 1150 S. = A. C. 1083 to 1093, and the commencement of it at about the beginning of the eleventh century. It has been already assumed on the strength of Vákpati's making grants of land in the neighbourhood of Ujjayini that he held sovereign power in that capital and the province in which it was situated, in the year of Vikrama 1036 = A. C. 980, and if we may attach any importance to their ultra-regal titles, his predecessors for three generations were anointed kings, who most probably, though not necessarily, did reign at the same place immediately before him. Consequently it must follow that either Vairisīṅha and his successors of the Sattara plate, including Siyaka, Munja and Bhoja, flourished after Vákpati and within 980 to 1083 A. C., or the latter was identical with Munja. The first alternative would give a century for four reigns and that on the supposition that Vákpati died immediately after the grant named above, while we have the authority of the *Kūmarapāla Charita* to shew that Munja was alive in 1079 Samvat = A. C. 1020, when Durlabha visited him on his pilgrimage,‡ and that of tradition, the *Bhoja Charita* and the *Bhoja Prarandha* to assign to Bhoja a reign of fifty-five years, seven months and three days, which leaves only six years unaccounted for, and to be disposed of either by assignment to Munja or Udayāditya. Professor Lassen has accepted the traditionary reign of Bhoja, and I feel fully dis-

* Colebrooke's *Misc. Essays*, II. p. 299.

† Wilson, Lassen and others have adopted the interpretation of Colebrooke, but the practice of the *sāmvatsarikāśrāddha* is so strictly observed in the present day, that I make no hesitation in rejecting it, and in so doing I am glad to find I have the support of Professor Weber.

‡ Lassen's *Zeitschrift*, Vol. VII. p. 220.

posed to acquiesce in it inasmuch as it would be impossible to account for his wide-spread fame over all India without allowing him a long and prosperous rule.

It is possible that some persons may be disposed to divide Malwa into two principalities, assigning one with Ujjayiní for its capital to the line of Vákpati, and the other with Dhárá for its metropolis, to the house of Munja. But this would not be in keeping with the known fact of the successors of Bhoja having owned the whole of Malwa and a good deal beyond it for their dominion, and they were avowedly sovereigns of much less renown and acquisitive tendency than their ancestors; not to advert to the rather improbable fact of Dhárá and Ujjayiní, having each a Siyaka and a Vairisiñha at the same time.

A not very weighty objection to this identification of the two Vairisiñhas and Siyakas arises from the tenor of one of the land grants of Vákpati which was ratified by a Rudráditya and which consequently implies his vassalage or subordination to him. A second grant of his, however, which is four years earlier, was issued without any ratification and under the authoritative declaration, "by my own order" स्वयं आज्ञादायकः. Besides the princes of Central India and indeed of India generally, held their power under such uncertain tenure and within such circumscribed areas that their independence and vassalage were matters of frequent recurrence and they cannot be used as arguments against their consecutive reigns in their own dominions. At any rate should the reign of Vákpati and his predecessors in Malwa be on this account doubted, still the relationship of Bhoja cannot for that reason suffer, while the dates of his successors leave no doubt as to his era.

Those dates have been verified; first, by the inscriptions from Sattara and Nagpur which place Lakshmadeva and Naravarma in 1161 S. = 1104; second, by three inscriptions from Ujjayiní, one of which gives the dates of Yasovarman (1191 S. = A. C. 1137), and the other of his son Lakshmivarman (1200 S. = A. C. 1143); and third, by an inscription from Piplianagar* which places Arjunavarman the great grandson of Yasovarman in S. 1272 = A. C. 1211—1215, and the statement of which has since been verified by a copper-plate

* Ante, Vol. VII. p. 726.

from Schore bearing the same date.* These leave no doubt as to Bhoja's reign having closed between 1083 to 1093 of the Christian era, and taking the traditionary period of his reign to be correct, his accession to the throne of Dhárá would be placed in the year 1026. This would give a reign of near fifty years to Vákpati *alias* Munja, which under ordinary circumstances cannot but raise our suspicion, but with the date before us we must accept it as a fact until otherwise settled by future enquiry.

A stone inscription from Bhera Ghat on the Nurbudda† calls Alhanádeví, the queen of Gayákarnádeva of Chedi, the granddaughter through her mother, of Udayádivya, and makes one of her sons, Narasiñha, reign in the year A. C. 907, another, Jayasiñha, in 928, and her great grandson, Ajayasiñha, a minor, in 932. This carries Udayádivya a century before Bhoja. The anachronism, however, may be explained if we assume the Samvat of the inscription to be other than that of Vikrama, probably of Vallabhi, though it is doubtful if that era ever extended so far as Chedi.

Commenting on an inscription from Oodeypur near Sagore, Mr. Torrens‡ was led to assign Udayádivya to the seventh century, and Lassen adopting that assignment made it correspond with the date given in the Ayín Akbery. But the transcript of the document as decyphered by Kamalákánta is so full of lacunæ and so imperfect with all, that it has no claims whatever to any consideration. The Udayádivya era supposed to be mentioned in it is simply the result of an illusion.

Bentley places the close of Bhoja's reign in the year of Christ 1082.§ which differs from our assignment by only a single year. Lassen's date is wider by ten years, owing to his having assumed the death of Naravarma to have taken place in 1190 and not a few years before it, as we assume to have been the case. The differences, however, are so slight that they cannot affect the general conclusion that Bhoja Pramára lived in the middle of the eleventh century, his reign spreading to within a few years of 1026 to 1083 of the Christian era.

* Journal American Oriental Society, Vol. VII. p. 24.

† *Idem*, Vol. VI. p. 499.

‡ *Ante*, Vol. IX. p. 545.

§ Asiatic Researches, Vol. VIII. p. 243.

Extracts from a report from Major J. T. WALKER, Engineers, Officiating Superintendent, Great Trigonometrical Survey, to the Secretary to Government of India, Military Department.

Dated Dehra Dhoon, 25th August, 1862.

SIR,—I have the honor to narrate the progress made in the course of the operations of the Trigonometrical Survey, since its late Superintendent, Sir Andrew Waugh, submitted his last Tabular Progress Report, with his No. 13,115, dated 31st January, 1861, to your office.

* * * * *

3. The operations in Kashmir under the superintendence of Captain Montgomerie have made good progress, notwithstanding the increasing difficulties which have had to be encountered as the work progressed, and entered higher and more inhospitable ground. In the year 1861 the triangulation was extended over an area of more than 12,000 square miles, including some very elevated and difficult country in Zanskar, Rukshu, the Upper Indus, and in Khagan and Nubra. At several points it was carried up to the Chinese boundary, and stations were visited in the neighbourhood of the Parang and Baralacha passes, where a junction of secondary points was formed with the North West Himalaya series, the basis of the degree sheets recently published in Calcutta by the Surveyor General. The stations in Ladak and on the Upper Indus were very high, generally over 17,000 feet. Mr. Johnson took observations at one station more than 20,600 feet high, the greatest altitude yet attained as a station of observation. Several remarkable peaks Trans Indus, probably forming the watershed between the Chitral and Swat valleys, were fixed from the stations West of Khagan.

4. The topography embraces an area of about 14,500 square miles, executed on the scale of 4 miles to the inch, leaving but a very small portion of Little Thibet unfinished, and completing the greater portion of Nubra, Ladak, Rupshu, (or Rukshu) and Zanskar. Several of the Salt Lakes on the table-land of Rukshu have been surveyed. Some exceedingly difficult ground was sketched by Captain Austen in Little Thibet, varying in altitude from 7000 to 28,300 feet above the sea. The glaciers he has discovered and surveyed are

probably the largest in the world out of the Arctic regions, the Baltoro Glacier, in the Braldo branch of the Shigar valley, being no less than 36 miles long. The Biafoganse is nearly as long, and forms, with the glacier on the Nuggair side, a continuous mass of ice nearly 64 miles in length. To delineate them properly a great amount of roughing and exertion, and not a little danger, had to be undergone by Captain Austen, as it was necessary for him to encamp on them for days, and to ascend to great heights on either side.

5. The carrying out of these interesting operations has involved vast labour and exposure. The country was found to be barren and desolate in the extreme, and the weather very unfavorable, in consequence of the extraordinarily heavy rains, for which the year will probably be long remembered. Contrary to their wont the clouds crossed over the south of the Himalayas to the northern side, bringing heavy falls of snow in August, and generally hindering the work. Supplies and firewood had to be carried great distances, argols of yak dung being often the only fuel available. Under these circumstances, the outturn of work is most creditable to the officer in charge and his assistants. Captain Montgomerie testifies to the zeal and cheerfulness with which all under his orders have executed the difficult tasks assigned to them. He also acknowledges the cordial assistance which the members of the Survey have invariably received from the Maharajah of Kashmir and his higher officials.

6. The Kashmir party being employed in mountains which are only accessible during the summer months, its field season is the period of recess of the Trigonometrical parties employed in ordinary districts. The usual survey year commences in October, by which month the computations and maps of the preceding field season are generally brought up, and the party is ready to take the field again. The Kashmir survey year is exceptional and commences in March. The officers in charge of the various parties submit their respective annual reports on the termination of the field operations, which are the real test of the advance made during the year. Thus the Superintendent of the department cannot prepare progress reports for strictly synchronous periods. Sir Andrew Waugh's last report embraced the summer of 1860, and the preceding winter. The present narrative embraces the summer of 1861, and the winters of 1860-61 and 1861-62, and consequently gives the progress which has been

made in two successive field seasons of ordinary triangulation and one season of the Kashmir operations.

* * * * *

“Lieutenant Melville, commencing in the north of Zanskar (or Zaskar) surveyed a large portion of it, including all the large glaciers, to the west, as well as those, at the head of the Butnai river. Some of these glaciers were 15 to 7 miles in length. Total progress very good, and with the trigonometrical points now available he will be able to complete the sketch of Zanskar during the ensuing season. Whilst surveying, Lieutenant Melville made some very successful and characteristic photographs of glaciers, and of the country generally.’”

7. The COAST SERIES,* between Calcutta and Madras was placed under the superintendence of Captain Basevi, Bengal Engineers, in the autumn of 1860, the exigencies of the department having required his transfer from the Trans-Indus frontier all the way to the Madras Coast.—His operations commenced in the vicinity of Vizagapatam, and were proceeding towards Rajahmundry, when on approaching the hill of Kapa in the Rampa estate, he found that his signallers had been driven away from the hill with threats of violence, and that the inhabitants of the district were assembling to prevent him from ascending. The estate is rent free, and the people are a lawless set, though under the control of the Godaveri Magistracy. Captain Basevi, having obtained an extra Military Guard and a body of Police, made his way to the summit of the hill without molestation, and took the necessary observations. One day, the people set fire to the grass on the hill, which was about 8 feet high, and a Rajah brought intelligence that they were collecting to attack the Surveyors; but the fire was extinguished, and the attack was not attempted. Captain Basevi’s chief apprehensions were for the signallers, whom he had to leave behind at the station, but a guard was left with them, and they were unmolested. The only serious inconvenience occasioned was in having to construct the station on a block of laterite several feet below the hill, for the summit was covered with dense jungle

* On the Coast Series, the principal operations consist of 42 triangles, arranged so as to comprise one double and five single polygons, and one quadrilateral. Twenty-one triangles were measured during the first season with a 2-foot Theodolite by Barrow, giving a mean triangular error of $0''.65$, and an equal number measured the next season, with a similar instrument by Troughton and Simms, gave a mean error of $0''.37$.—Azimuthal observations on Circumpolar Stars were taken at three stations.

which there was no means of clearing away without the assistance of the villagers, all of whom had absconded.

8. Fortunately, such interruptions are of rare occurrence, only happening in the unusually lawless districts around Hyderabad. The operations proceeded without further opposition or hindrance, excepting from the physical difficulties of the ground passed over.—The district between the Godavery and Kishna rivers was crossed, with considerable trouble, owing to the absence of high hills, and the undulating nature of the ground, which was all the more difficult because covered with dense jungle. Thus the selection of stations in such a manner as to form an unbroken chain of quadrilaterals and polygons, became a very tedious and laborious undertaking, involving the repeated rejection of positions which at first promised the requisite visibility in all directions, but were afterwards found to be deficient in some essential relation. Nevertheless, in the two field seasons the principal triangulation was carried a distance of upwards of 180 miles. It has now reached a point in the Guntoor district near the meridian of Madras, whence it will merge into the meridional arc which is intended to connect Jubbulpore and Madras, and to be extended southwards into Ceylon.

9. After completing his triangles thus far, Captain Basevi returned to Vizagapatam, to select a site for the base line of verification, which it is proposed to measure in this neighbourhood. He succeeded in obtaining a suitable site, but not until his field operations had been so long protracted that it was the middle of June before he could break up his camp and return to quarters. In the event of Captain Smyth's expedition into Central India taking place, Captain Basevi has been nominated to accompany it in the capacity of Astronomer and Topographer.

10. The *INDUS SERIES*, running parallel to the western frontier of British India, was completed by the close of the field season 1859-60, when the late Surveyor General decided on carrying an oblique series along the south east bank of the Sutlej, from Mitunkote to Ferozpour, to tie up the Punjab meridional series, and form a basis for future triangulation into the deserts of Sind and Rajpootana. Certain small portions of the Indus triangulation which had been executed with a two-foot theodolite gave unusually large re-entering errors. Lieutenants Herschel and Thuillier, both of the Bengal Engineers, and first As-

sistants of the Great Trigonometrical Survey, were consequently sent to revise them with the great theodolite, while Mr. Armstrong was selecting stations and building towers on the line of the Sutlej. Twenty-one principal triangles were ably and rapidly revised, after which Lieutenant Thuillier proceeded to join the Kashmir party while Lieutenant Herschel took in hand the Sutlej triangulation.* This consists of a series of single triangles, of which one flank rests on the sand hills fringing the Bahawulpore desert, and the other in the lowlands which are periodically inundated by the Sutlej. Thus the greater portion of the rays traverse moist jungles of tamarisk and long grass, alternating with ridges of sand, forming a combination which is peculiarly troublesome in disturbing the atmosphere,

* Lieutenant Herschel took astronomical observations for the direct determination of azimuth at 3 stations at an average distance of 72 miles apart. His mean triangular error is 0.53. In 85 angles his mean probability of error is 0.25 between extremes of 0.10 and 0.38. He has given the following interesting table as a test of the accuracy of his work.

(A)		Maximum difference between observations.									Total.	
Number	(B) of measures in a set.	0''	1''	2''	3''	4''	5''	6''	7''	8''		9''
		to 1''	to 2''	to 3''	to 4''	to 5''	to 6''	to 7''	to 8''	to 9''		
2		1	0	0	0	0	0	0	0	0	0	1
3		223	251	93	0	0	0	0	0	0	0	567
4		3	13	65	22	1	0	0	0	0	0	104
5		0	5	4	29	13	1	0	0	0	0	52
6		0	0	0	5	11	5	3	0	0	0	24
7		0	0	0	0	0	0	0	0	0	0	0
8		0	0	0	0	0	0	0	1	1	1	1
9		0	0	0	0	1	0	0	0	0	0	1
Total.		227	269	162	56	26	6	3	1	1	1	750

Total 0'' to 3'' = 658. Total greater than 3'' = 92.

In this Table the unit is a set of measures of an angle on a single Zero, the arguments being A, the maximum difference between the respective measures forming a set, and B the number of measures.

Lieutenant Herschel has introduced an improvement in the referring marks at present used in the survey. Instead of having two apertures one for a lamp, the other for a heliotrope, he made both lamp and heliotrope illuminate the same piece of ground glass, the aperture of which was limited by a circular diaphragm of diameter suitable to the distance. Thus one object is intersected instead of two, and there is no flickering or unsteadiness of signal from wind or imperfect direction of heliotrope; there is no dazzle from too bright a sun, nor total disappearance in its absence, for the mere reflection of the sky suffices to illuminate the glass in tolerably clear weather. One mile is considered the best distance for such a mark.

and causing lateral refraction to perplex and weary the observer, and impair his measures. The principal operations consist of 38 triangles, extending over a distance of 132 miles from a side of the Indus series below Mitunkote to the vicinity of Pak Puttun. Being entirely in the plains they cover an area of only 1,960 miles.

11. Lieutenant Herschel reports that "all the principal towns and villages along the line of the series have been fixed where practicable. They are necessarily few in number, as the country is more and more thinly populated from Ahmedpur eastwards as far as the British boundary. From Bahawulpore to Fazilka, the towns become fewer and of less importance, reaching a climax of insignificance in Bahawalpurh, the capital of nearly half the whole state, which is nothing but a hamlet without a single pukka house in it, and deriving its importance apparently from nothing but the prestige of an old ruined fort, and the residence in it of the temporary holder of the largest (but by no means the richest) Kardari in the states. The country is singularly poor in mosques, temples, tombs, or indeed prominent buildings of any kind."

12. The RAHOON MERIDIONAL SERIES,* under the charge of H. Keelan, Esq., first Assistant Great Trigonometrical Survey, has advanced a distance of 176 miles, by 33 principal triangles, arranged in quadrilaterals and hexagons, covering an area of 4,130 square miles. It has laid down the positions of Jeypoor, Ulwar, Deoli, Boondi and numerous other places of importance. In one more field season, it should reach the Longitudinal Series between Calcutta and Karachi, where it will terminate. The published Charts of the Kotah and Boondi territories indicate a succession of hills over which it was supposed that the triangulation might have been carried and completed last season. But the ground was found to be the very reverse of what had been expected, and to require the construction of towers, thereby protracting the operations into another season.

13. The GOORHAGURH MERIDIONAL SERIES,† under the charge of

* Mr. Keelan employed Colonel Waugh's 2-feet Theodolite No. 1, in his triangulation. The average error of his 33 triangles is $0''.36$. The mean probability of angular error is 0.30, between extremes of 0.12, and 0.55. Azimuth observations were taken at 3 stations. The secondary triangulation covers an area of 7,040 square miles.

† Mr. Shelverton employed Colonel Waugh's 2-feet Theodolite No. 2 in his triangulation. The average error of his 50 triangles is $0''.54$. The mean probability of angular error is 0.46 between extremes of 0.19 and 0.87. Azimuth

George Shelverton, Esq., Civil second Assistant Great Trigonometrical Survey, traverses a meridian close to that of Umritsur, and was brought to a termination last season by joining the Arumlia Series, which had some years previously been carried, by Captain Rivers of the Bombay Engineers, up an adjacent meridian, as far as Ajmeer, from the Great Longitudinal triangulation. From Sirsa to Ajmeer it crosses a desert tract, of which Mr. Shelverton reports that "the main difficulties encountered were scarcity of water, of building material, of laborers and of provisions. The country traversed had suffered for three years from extreme drought; large villages, originally containing upwards of 500 families, had been deserted by all except first class farmers who were too proud to work. Wholesome water was scarcely procurable, and water even for building purposes had frequently to be conveyed from distances of 4 and 5 miles. The largest reservoirs of water upon which the inhabitants depended for their supply during the greater part of the year had invariably been exhausted, and the expensive kucha wells of the country barely sufficed for local wants. It was therefore under very adverse circumstances that the Goorhagurh Meridional Series was conducted during the field season of 1860-61."

14. During the following season the deserts of Bikaneer, Shekhawati and Marwar were extensively traversed, and a very large area of both principal and secondary triangulation was executed, reflecting much credit on Mr. Shelverton and his assistants, who skilfully and energetically availed themselves of the facilities offered by mounds and hills, commanding extensive prospects, to fix a large number of positions of importance. In the two seasons the triangulation was carried a direct distance of 342 miles by 50 consecutive triangles, covering an area of 4,454 square miles.

15. The ASSAM PARTY,* in charge of C. Lane, Esq., Chief Civil

observations were taken at only one station. The secondary triangulation covers an area of 10,954 square miles. Owing to the paucity of good natural or artificial objects, 152 secondary station marks were built for future reference.

* The area of Secondary Triangulation executed during both seasons is 10,250 square miles, fixing the positions of Silchar, Sylhet, Jyntiapor and numerous other places of importance. One azimuth only was determined by astronomical observation.

Mr. Rossenrode reports as follows of the tribes who inhabit Independent Tipperah: "The Court of the Rajah at Agratolla is composed entirely of Bengalis. A Brahmin of Bengal has the sole management, and conducts the affairs of the state. Being a Brahmin he is also the spiritual adviser of the Rajah

Assistant, was employed in 1860-61, in triangulating along the Eastern Frontier, from the south of Gowhatty to Cherra Poonjee. Recent prohibitions regarding the impressment of coolies occasioned much embarrassment, notwithstanding that the majority of the Cossyahs are porters by trade; delay was thus caused in taking the field, and

pays him the greatest reverence and respect, and remains standing during any interview which may take place between them. The Praboo, as this Brahmin is called, is not very popular from having cut down the expenses of the Rajah, reduced his retinue, discharged many of his retainers, and sold the superfluous elephants and horses. He has done much good since the country has been under his management. A younger brother of the Rajah, Barchand Thakoor, resides at Agratolla. He has received the rudiments of an English education, and has been taught Chemistry, Medicine and Photography, and amuses himself with taking likenesses. He takes no part in business, and seems to have no influence whatever.

"The court being composed of Bengalis, none of these men were willing, or would volunteer their services when an agent was required, to accompany Mr. Ellison, and their reluctance to do so may be attributable to the difficulties they would have to encounter in an unexplored, uninhabited portion of the country through which Mr. Ellison pointed out to them on the map that the work would have to be conducted.

"On enquiry, Mr. Ellison learned that the country was uninhabited owing to the inroads of the Kachak Kookies, an independent tribe, who leave their hills and fastnesses in the interior, and make frequent forays, plundering and murdering the Tipperah Rajah's people. The great dread of this savage and inhuman tribe causes such a panic throughout this portion of the country, that all the inhabitants deserted their villages and settled on the Frontier, or in the Cachar, Sylhet and Comillah districts, and no persuasion will induce them to accompany a small detachment such as Mr. Ellison's was. With a large armed force able to repel any attack, these very people, formerly subjects of the Rajah of Tipperah, are ready to render every assistance, and to guide the force, in order that the Kachak Kookies may be severely punished, nay exterminated from the country.

"There are several tribes in Independent Tipperah. The Kookies, Nagas and Tipperahs inhabit the hills and jungles. They select a locality for their village, clear it and the surrounding hills and valleys, and cultivate the rich virgin soil for two, three, or at the utmost, four years, and then remove to some other equally favorable locality. They chiefly cultivate cotton, a fourth of which is given to the Rajah annually; a portion is spun and manufactured into coarse cloth for household use, and some pieces of cloth of better texture, as well as the surplus cotton, are taken to the nearest bāt, or market, and exchanged for goats, pigs, dogs, fowls or ornaments. They also cultivate rice, yams, and a gram termed chena, (which grows only on these hills,) for their own consumption. The Kookies and Nagas have no caste, they eat dogs and cats; in fact every animal and every bird is eaten. The Kookies of Assam, Cachar, Manipur and Tipperah have different dialects, and the same may be said of the language of the Nagas of the above-named places. The Tipperahs, in dress, appearance and habits, resemble the inhabitants of Assam. They have their own language and are a low caste of Hindus; from constant intercourse with the people of the plains they are more civilized, and understand Bengali. The Tipperahs are candid, straight-forward, cheerful, and of all the hill tribes met with on this side are most trustworthy and intelligent. The Kookies and Nagas are a sullen, morose, treacherous set, and cannot be conciliated or depended upon. They do not mix with their neighbours, and consequently retain their barbarism. The Cachar Kookies are an independent tribe, and nothing is known of them except that they make frequent incursions, rob, plunder and murder, the inhabitants."

often afterwards. Mr. Lane reports that it frequently proved of assistance, as a turning point to the arguments employed to persuade these loyal people to act as porters, to tell them they were required "on Her Majesty's Service," interpreted "Maharancee ka kam." The operations were further impeded by clouds and mists, and latterly by storms of such severity that on one occasion the whole of the Bunder Bazar, on the bank of the Soorma, was utterly destroyed and no vestige left. Final observations were taken for 19 principal triangles arranged in a double series, extending over a direct distance of 62 miles, and covering an area of 1,207 square miles. Eight important Snowy Peaks of the Bhotan Himalayas were fixed.

16. During 1861-62, Mr. Lane was absent on leave on medical certificate, when his place was ably filled by Mr. W. C. Rossenrode, who extended the triangulation a direct distance of 89 miles eastward through Cachar towards Munipoor, and 25 miles southward towards Independent Tipperah, in all 114 miles, by 30 triangles arranged in a double series covering an area of 2,024 square miles. Some of the stations were situated in the Jynteapore district, but the observations at them were fortunately completed before the present rebellion broke out. Reciprocal observations had still to be taken to them from other stations around, necessitating the employment of Hindustani clahis to work the signals on them; the men though robbed and threatened, maintained their posts during the rebellion, and only came away when signalled to do so at the termination of the observations.

17. I have already reported that on learning that the Bengal Government had ordered a survey of Independent Tipperah to be made, I arranged with Mr. Buckland, the Commissioner of Chittagong, for our triangulation to be carried across Tipperah, on the direct line from Cherra Poonjee to Chittagong, instead of taking an extensive circuit westwards, as was originally contemplated, in order to keep within British Territory, and away from a frontier believed to be insecure. Mr. Ellison was deputed to enter Tipperah to reconnoitre the country, and select sites for the stations. He was considerably delayed by having to wait for the Rajah's Agents, but he made some progress, and is reported by Mr. Buckland to have "behaved with much tact and patience, although he had to encounter the usual obstructiveness of the Rajah and his people." Mr. Elli-

son has supplied some interesting information regarding the hill tribes inhabiting Independent Tipperah, which I have extracted from Mr. Rossenrode's report and given in the foot notes.

18. The BOMBAY PARTY,* under the superintendence of Lieutenant now Captain C. T. Haig, Bombay Engineers, 1st Assistant, was engaged in 1860-61, in completing the triangulation necessary to connect the Guzerat longitudinal series, on the parallel of 23° , with the Singi meridional series, which had been brought up from Bombay as far as Surat, by Captain Rivers, some years previously. The connexion was satisfactorily accomplished, notwithstanding that the section of the party employed in selecting stations, got entangled in some malarious jungles, where both Europeans and Natives were attacked with jungle fever, and had to retire to Broach until the sickly season was over. In 1861-62, the Guzerat longitudinal series was extended eastwards to the Khanpisura series on the meridian of 75° , and a series of triangles on the meridian of Oodipoor was carried between it and the Karachi longitudinal, thus completing the triangulation of the northern portion of the Bombay Presidency. The principal operations involve 125 miles of triangles arranged in a double series, and about 190 miles arranged singly, the total number of triangles being 42, covering an area of 7,450 square miles.

19. The LEVELLING OPERATIONS,† under Captain Branfill, of the

* Astronomical observations for azimuth were taken at two stations.

Of the Meridional Series, south of Oodipoor, Captain Haig reports as follows. "The country through which this series runs is inhabited by the wildest set of savages that I have as yet ever had to do with. The thieves (who form a portion of the inhabitants of every village) for the sake of the clothes a man has on his back, assault him; if he attempts to escape, they bring him down with a shower of arrows, utterly regardless of his life. On this account, communication by messengers was attended with great risk, and consequently Messrs. Dacosta and McGill were each unacquainted with the other's progress until they actually met, otherwise I had intended them to be in frequent communication. It is partly due to this that the Series has a bend in the centre, and partly because the Rajah of Saloomber, a very refractory chief, would not permit a Station to be built on his hills, although directed to do so by the Political Agent."

Mr. Dacosta was employed in carrying a Secondary Series of triangles along the west coast of the Gulf of Bombay, from the mouth of the Sabarmuthee river to Gogo, over a flat tract of country, which for a great portion of the year is entirely under water. Also in selecting principal stations for the Mangalore and Oodipoor Series, over a meridional distance of upwards of 180 miles. He laid out a Secondary Series down the east coast of the Gulf of Cambay as far as Surat, and carried other triangles to fix the position of Baroda.

† During the course of the levelling operations, it has often been noticed that though the independent results obtained at each station by the respective observers differ if at all by almost imperceptibly minute quantities, the differences have a tendency to go all one way, and have occasionally accumulated to large

late 5th Bengal European Cavalry, second Assistant, have made good progress, having in the two field seasons been carried from a point near Mitunkote, on the Indus line of levels, to the Dehra Dhoon Base Line, viâ Bahawalpoor, Ferozpoor, Loodiana, Umballa and Saharunpoor, and thence on to the Seronge Base line in Central India, viâ Meerut, Allygurh and Gwalior, over a distance of 999 miles. In the course of these operations, stone bench marks were fixed at distances of 12 to 15 miles, and the most substantial milestones met with by the road side were also determined, for future reference by Canal or other Engineers engaged in levelling operations. A satisfactory connexion has been made with the Ganges, and the eastern Jumna Canal levels, and with those of the Allahabad and Agra Railway, which are now capable of being reduced to the mean sea level as a common datum.

20. The COMPUTING OFFICE in Calcutta, under the superintendence of Baboo Radanath, chief computer, was engaged in completing the triplicate manuscript volumes of the General reports of the Parishath, Hurilong and Chendwar Meridional Series, and in furnishing elements for the various Topographical and Revenue Survey Parties requiring them. In March last, Baboo Radanath retired on a pension, after 30 years' service, during which he had repeatedly earned the approbation of the successive Surveyors General under whom he had served. On his resignation it was deemed advisable to remove the computing office from Calcutta to the Head quarters of the Trigonometrical Survey at Dehra Dhoon, to bring it into more direct

amounts. On this curious and perplexing subject, Captain Branfill reports as follows :

“ I think we can all subscribe to the following facts—The state of the weather and the season of the year have a very considerable effect on our results, as shown by the difference between observers. We have found that the apparent law of our differences is least developed some time in the middle of the cold season. In a run of bad weather (*i. e.* bad for the work) the apparent law of our difference is for the most part marked when the atmosphere is clearest, and when we have supposed our observations to be freest from error ; and conversely in a run of good weather, when the air is hazy from smoke or dust, or greatly agitated by wind, and, in short, when we have found most difficulty in reading the staves, our results have most coincided with each other. Our differences do not appear to vary with the distances of the staves. On the contrary the differences are perhaps even more marked as the day grows older, and the distances of the staves from the instrument are reduced. The general direction in azimuth of the line of our work has some connection with the cumulative differences, and we have noticed that the tendency to differ is more marked when proceeding *towards* a certain point of the compass, than when proceeding *from* that point towards its opposite.”

connexion with the Superintendent of the department, and also with the field parties whose computations it has to revise and collate.

21. The distant location of the computing office had entailed the formation of a small office at Head Quarters under the superintendence of J. B. N. Hennessey, Esq., first Assistant Great Trigonometrical Survey, composed of native Surveyors, and newly joined Sub-Assistants, who thus had an opportunity of being rigorously trained in the theoretical portion of their new duties. This little office has lately completed the triplicate manuscript copies of the General report of the north-eastern longitudinal triangulation, between Dehra Dhoon and Purneah, in two thick imperial volumes; it has also been employed in revising the computations of the mountain triangulation of the north-west Himalaya Series, computing 3 volumes of the report of the Levelling operations, and preparing the triplicate general report of the Trans-Indus Frontier Survey; also in supplying elements, examining candidates, instructing new assistants, and other current work.

22. The Drawing Office, under superintendence of W. H. Scott, Esq., Civil Assistant Great Trigonometrical Survey, has been chiefly employed in compiling maps of Kashmir and Ladak, from the plane table sheets sent in by Captain Montgomerie. The first of these large maps has already been transmitted to the Home Government, the second is well advanced. Ten original preliminary charts of the triangulation in different parts of India have been forwarded for the use of the Surveyor General's Office, and duplicates have been prepared for the Geographer to the Secretary of State for India. Triplicate charts have also been constructed for the manuscript volumes of the General Report.

23. Between the completion of a Survey, in this country, and its publication, a long interval invariably elapses, during which even the Supreme and Local Governments are without access to valuable information, acquired but unimpartible, because of the costliness of manuscript maps and the time occupied in their construction. I have therefore been induced to attempt to employ photography for making rapid copies of our maps and charts, as a temporary substitute for the final engravings. This process has of late years been extensively adopted in the Ordnance Survey of Great Britain for reducing maps, as a substitute for the pentagraph. Two complete

sets of photographic apparatus were sent out to this country by the Secretary of State for India, for similar employment, and it is with one of these that I am endeavouring to have our maps copied. The operation is by no means easy, for the apparatus has had to be specially adapted to make full scale copies, and not reductions merely, for which it was originally intended, and the maps require to be drawn with special reference to future copying or reducing by photography. An ordinary finished map cannot be reduced without a large portion of the names becoming too microscopic to be easily legible. In the first Kashmir map the rivers were coloured in blue, and the broken land and low hills in red, the higher ranges being in Indian ink. Consequently a photograph of it would shew no rivers, and would invert the depth of shading of the high and low hills, bringing the latter into excessive prominence.*

24. Captain Melville, who has already been mentioned in connexion with the Topographical Survey of Kashmir, has attained considerable skill as a photographer, and succeeded in making an excellent reduction to half scale of the second Kashmir map, before any names were printed on it. The reduction will have the names inserted by hand, and will then be ready for being copied to full scale, and afterwards printed, for as extensive circulation as the limited means at my disposal will permit. I have every reason to hope that, with Captain Melville's assistance, I may be able to supply a want which has often been seriously felt.

25. In concluding this report of the operations of the Trigonometrical Survey, I am happy to be able to express my opinion that the progress made on all sides, both in the field, and during the recess, by the Survey parties, and by the offices at Head Quarters, has been most satisfactory.

* A Map of Asia between the parallels of 20° and 60° on the scale of 100 geographical miles to the inch, has been recently compiled under my superintendence, partly in this office, and partly in the Surveyor General's of which I had temporary charge from 10th January to 24th March last. It gives the most recent information available from our own and other sources of the countries between St. Petersburg and Pekin, Tobolsk and Calcutta. The boundaries of the territories respectively under British and Russian protection are shown, and the caravan routes from India to all parts of Asia. The map is now available in the office of the Surveyor General, Calcutta.

On Dr. Gerard's collection of fossils from the Spiti valley, in the Asiatic Society's Museum.—By HENRY F. BLANFORD, ESQ. A. R. S. M., F. G. S.

The paper, of which the following is a revised copy was read before a meeting of the Asiatic Society about eighteen months since, but its publication was fortunately deferred for a time, in order that the illustrations which now accompany it might be completed. In this interval, my friend, Mr. Theobald, returned from a visit to the Spiti valley, and on looking through the fossils which I had described, he communicated to me his conviction that certain of the specimens which I had identified as European Liassic species,* were not from the Spiti valley at all, but, in all probability, Whitby fossils which had been accidentally mixed up with Dr. Gerard's collection. These specimens had been admitted on the same authority as the majority of the others, viz., the Rev. Mr. Everest's figures in the 18th. Volume of the Asiatic Researches, and owing to the neglected state of the collection, and the absence of labels on the majority of the specimens, there had been no means of detecting his error.

The examination of undoubted Whitby fossils, of Col. Strachey's Niti collection and also of M. Jaquemont's collection in the Musée d' Histoire Naturelle at Paris, led me to the same conviction as Mr. Theobald, viz., that the Liassic species were in reality English specimens, and I accordingly wrote a postscript to that effect to be published together with the original paper. Shortly afterwards, however, I returned to India and as the paper had not then been put into type, I considered it better to withdraw and modify it in accordance with the above correction.

A very considerable alteration had indeed become necessary. The collection as originally examined consisted of a fauna in part Triassic, in part Liassic, and partly also Upper Oolitic, some of the species being either identical with species from the Oxford clay or closely allied to forms of that age. The Triassic specimens were not sufficiently numerous to lead me to infer the existence of a distinct formation of that age, and I contemplated the possibility of there being

* *Ammonites heterophyllus*, Sow. *Ammonites bifrons*, Brug. *Ammonites concavus*, Sow. *Ammonites Thouarsensis*, D'Orb. *Ammonites communis*, Sow. and *Pecten aequalris*, Sow. Five of these were figured by Mr. Everest in the 18th Volume of the Asiatic Researches, as forming part of Dr. Gerard's collection.

a Liassic formation in the Spiti valley, in which, as in the beds of St. Cassian, certain Triassic forms were intermingled. The Upper Oolitic forms, I regarded (with doubt,) as indicating a distinct formation. The fossils I had examined comprised a majority of Cephalopoda, with a few species of Gasteropoda and Conchifera. The Brachiopoda which formed part of the original collection I had not been able to discover in the Society's Museum.

Mr. Theobald's investigations have now established the existence of Triassic beds as well as those of Silurian and Upper Oolitic age, in the Spiti valley while the now proved spuriousness of the Liassic fossils described, eliminates this fauna from consideration. Further research in the Society's Museum, has yielded me the Brachiopoda of Dr. Gerard's collection and a number of other fossils, which, however, (with the exception of one or two ammonites) want of leisure at present compels me to defer for future examination. The former consist of *Producta*, *Spirifer*, *Terebratula* and *Rhynchonella*, some of them of Carboniferous age, but further than this I am not able to pronounce at present. This paper, therefore, confines itself to a description of the genuine portion of those species included in my original memoir.

I have mentioned that while in England I had the opportunity of examining the valuable collection of Oolitic fossils made by Colonel Strachey at the Niti Pass in Kumaon, as well as those from northern Nepal collected by General Hardwicke, and M. Jaquemont's collection from Spiti. This has rendered an alteration necessary in the names of those species which also occur in the above collections and had already been named by authors or discoverers. This has been effected in the present paper.

Class. CEPHALOPODA.

Order. DIBRANCHIATA.

1. BELEMNITES SULCATUS, Miller. Plate I. figs. 1, 2a-c.

This Belemnite is apparently identical with that occurring in the Oolitic rocks of Cutch, which has been described and figured by Mr. Sowerby, (Geol. Trans. 2nd Ser. Vol. V.) as *B. canaliculatus*, Schlottheim.

The Spiti specimens differ from those figured by Miller and D'Orbigny, in the guard being more compressed in form, so that the

dorso-ventral diameter is rather the longer. The angle of the phragmacone is about 17° , while that given by M. D'Orbigny is 18° to $18\frac{1}{2}^\circ$. These differences, however, do not appear to me to warrant specific distinction.

There are several phragmacones of this species in Dr. Gerard's collection. The largest is 2 inches in diameter. The largest guard measures as follows:—

- 3 in 10 lines long.
 — 10 $\frac{1}{2}$ „ lat. diam.
 — 10 $\frac{1}{2}$ „ ant. post. diam.

Order. TETRABRANCHIATA.

2. AMMONITES ACUCINCTUS, Strachey, Plate I. figs. 3, 3a.

A. testâ discoideâ, percompressâ, complanatâ, subœvigatâ, obsoletè flexuoso-costatâ. Anfractibus complanatis, amplexantibus. Ventre sub-acuto; juniore dentato. Umbilico parvo; marginibus rotundatis. Aperturâ angustè hastatâ. Lobo superiori septorum longiori.

Diameter of shell	1 inch	8 lines	}	A fragment wanting the body whorl.
„ of outer whorl	11	„		
Thickness	4	„		

With of outer whorl = $\frac{5.5}{100}$ of the diameter of the shell.

Nearly allied to several Liassic species, viz., *A. oxynotus*, Quensted, *A. lynx*, D'Orbigny, and *A. Coynarti*, D'Orbigny, this Ammonite is readily distinguished by the peculiar palmate form of the saddles, and the length of the superior lateral lobe as compared with the ventral [*quasi dorsal*] lobe. The denticulation of the keel is, as in *A. lynx*, only apparent on the young shell, and becomes obsolete with age. The sides are faintly marked with ribs curved like those of *A. concavus*. Dr. Gerard's collection contains two specimens of this species.

3. AMMONITES STRIGILIS,* n. s. Pl. III. figs. 1, 1a.

A. testâ discoideâ, costatâ, compressè tuberculatâ. Anfractibus amplexantibus, quadratis. Costis simplicibus, compressis, prominentibus, anticè inclinatis; apud venter, valdè angulatis. Ventre

* There is some doubt whether this specimen be really from Spiti, though there is I think but little question that it comes from the north Himalayan formation. It is one-half of a cut specimen. Another half specimen, (possibly the fellow of the above,) is in the British Museum, its locality being also unknown.

planato, costato. Umbilico angusto; lateribus leniter inclinatis, rotundatis.

Diameter of shell	2 inches 1 line.
„ of outer whorl	1 „ 2 „
Thickness	11 „

Width of outer whorl = $\frac{5.6}{100}$ of the diameter of the shell.

A peculiar form, combining the characters of the *Globosi* and *Amalthei* groups. The young shell is smooth, (in the single specimen described, to beyond the commencement of the body chamber,) and the last half whorl ornamented with strong, simple compressed ribs, inclined forwards from the umbilicus, and becoming more elevated as they approach the ventral region, on the sides of which, they rise almost into tubercles; then becoming less prominent as they bend forward on each side of the median line, they form an angle in the centre, being again elevated at the bend into a series of flattened tubercles. The whorls are rounded in the young, squared in the old shell. The sutures are very imperfectly seen: the saddles appear to be squared in form, and symmetrically divided, and the superior lateral lobe is probably longer than the ventral as in the *Globosi*.

4. AMMONITES WALLICHHI, Gray, Plate I. figs. 4, 4a, Plate III. figs. 2, 3.

A. testâ discoideâ, compressâ, transversim costatâ. Anfractibus subcompressis, complanatis. Ventre angusto, excavato, levigato. Costis acutis, bifurcatis, haud tuberculatis. Umbilico lato, profundo. Aperturâ oblongo-quadratâ. Septis, lateraliter 5-lobatis.

Diameter of shell	1 inch 9 lines.
„ of outer whorl	7 $\frac{1}{3}$ „
Thickness	7 „

Width of outer whorl = $\frac{3.5}{100}$ of the diameter of the shell.

This ammonite, of which there are two specimens in the collection, is allied to *A. Parkinsoni*, Sowerby. The chief points of departure from the latter species are;—the absence of tubercles; the greater width of its whorls ($\frac{3.5}{100}$ instead of $\frac{2.7}{100}$ of the diameter); and some differences in the sutural lobes, the superior lateral being barely so long as the ventral lobe, and having fewer ramifications than that of *A. Parkinsoni*. The two specimens before me differ somewhat

in the characters of the ribbing of the outer whorl, those of the inner whorls being exactly similar: the specimens are of the same diameter, but while that figured at Plate I. fig. 4, appears to be full grown,* that figured at Plate III. fig. 2, is only a fragment, wanting the body chamber, and the body-whorl of the former specimen, as is the case with many Ammonites and Nautili, is thicker than the inner whorls in proportion to their diameter, and exhibits a coarser and wider ribbing, the ribs being rather inclined backwards. *A. fissus*. Sow, from the Oolites of Cutch, bears a general resemblance to the present species, but it appears from the description to have the ribs continuous across the back.

5. AMMONITES OCTAGONUS, Strachey, Plate I. figs. 5a—c.

A. testâ discoideâ, compressâ. Anfr. parum amplexantibus, rotundatis, lateraliter seriebus 3 tuberculis magnis ornatis, irregulariter costatis. Aperturâ ellipticâ. Septis lateraliter 3-lobatis.

Allied to *Ammonites Eugenii* of Raspail, to which species I referred it in the first instance. It is ornamented with three rows of prominent tubercles connected by depressed and somewhat irregular ribs.

Only one fragment of this Ammonite is in Dr. Gerard's collection, viz., that figured. It does not allow of my determining the spiral proportions.

6. AMMONITES NEPALENSIS, Gray, Plate I. figs. 6, 6a.

A. *Nepalensis*. Gray, Hardwicke's Illustrations.

A. testâ discoideâ, compressâ, complanatâ, costatâ; anfractibus perlatiis. Costis filiformibus bi-vel tri-furcatis. Ventre rotundato. Umbilico angusto. Aperturâ compressè ellipticâ. Septis?

Diameter of shell	1 inch 5 lines.
„ of outer whorl	9 „
Thickness	6½ „

Width of outer whorl = $\frac{5.3}{100}$ of the diameter of the shell.

An Ammonite of the Macrocephali type, but more compressed, ornamented with distinct filiform ribs, bifurcating or trifurcating about the middle of the whorl, and arched forwards in the ventral region. The sutures are not visible. A single specimen occurs in Dr. Gerard's collection. It is much smaller than Dr. Gray's type, and has a somewhat narrower umbilicus. Some large specimens were, however, collected by Mr. Theobald.

* If so, however, the specimen is a small one, as one in Col. Strachey's collection is nearly 4 inches in diameter and one in the British Museum not less than 6 inches.

7. AMMONITES TENUISTRIATUS, Gray.

A. tenuistriatus, Gray, Hardwicke's illustrations.

A single cast containing a portion of the body whorl in which is a beautiful cast of an *Aptychus*, is to be referred doubtfully to the above species. The curvature of the ribs is similar to that of the type, but the whorls are narrower and rather thicker. Judging from the few specimens I have seen, *A. tenuistriatus* appears, however, to be very variable in this respect, and I refer the Spiti specimen therefore provisionally to this species.

8. AMMONITES BIPLEX, Sowerby, Plate II. fig. 5, Plate III. figs. 4, 4a—c, 5.

Ammonites. Everest. As. Res. Vol. XVIII. Pt. II. p. 114, Pl. I. figs 2, 3.

A. annulatus. Sowerby. Op. et. vol. cit. p. 278.

Several specimens of an Ammonite, which I cannot distinguish from the well known Oolitic species above quoted, occur in the collection, in black siliceous nodules. One large specimen measures 5 inches and 2 lines in diameter. Others less perfect, from 3 to $3\frac{1}{2}$ inches. The width of the outer whorl varies from $\frac{33}{100}$ to $\frac{37}{100}$ in the more typical specimens, and the aperture is almost orbicular, slightly flattened at the sides. The ribs are sharp and numerous, and bifurcate very regularly at about $\frac{2}{3}$ across the whorl. Most of them have an occasional deep sulcation, indicating the position of a previous mouth. The sutures correspond closely to that figured by M. D'Orbigny in the Pal. Française.

In addition to the above, two specimens, which at first I hesitated to regard as the same species, have the ribs much more numerous, and the whorls wider; the outer whorl being $\frac{38}{100}$ and $\frac{41}{100}$ respectively, of the diameter. That with the latter measurement is moreover more compressed than the typical specimens, the thickness being $\frac{37}{100}$ only. On consideration, however, I can see no good reason for regarding these specimens as specifically distinct from the more typical. Their sutures are very similar, and as regards form, the narrower whorled of the two differs but little from the type, while the peculiar close set ribbing distinctly indicates the specific identity of the two. One of these is figured at Plate III. figs. 4, 4a.

An important point to be noticed in comparing full grown speci-

mens of this species, and indeed of many of the *Planulati* and some other Ammonites, is that the last two or three sutures are frequently closer than the preceding, and are more or less shortened and distorted. In order, therefore, to establish a reliable comparison, and to avoid erroneous specific distinctions, one of the older sutures should be regarded as the standard. I give an illustration of this in figs. 4*b* and 4*c* of Plate III. the first of which represents the last suture of the whorl, (that terminating the body chamber,) the second, the sixth suture of the same specimen, counted backwards. I have observed similar irregularities in *A. inflatus*, and many Nautili (*e. g.* *N. Bouchardianus*.) have the last one or two chambers considerably narrower than those formed during earlier growth.

Fig. 5, Plate III. is the last suture of a specimen of the normal variety of *A. biplex*, which I give as it is the only one visible on any of my specimens.

9. AMMONITES TRIPLICATUS, Sowerby.

Two specimens differ from the preceding in having the ribs, especially those of the last whorl, trifurcate. I have seen specimens both from Niti and Spiti with fasciate ribs, but otherwise undistinguishable from *A. biplex*. I am inclined to doubt whether they be other than varieties of that species.

10. AMMONITES TORQUATUS, Sow. ? Pl. III. figs. 6, 6*a*, 7, 7*a*, 8.

A. testâ, discoideâ, compressâ, costatâ, latè umbilicatâ. Anfractibus rotundatis, depressis, convolutis. Costis filiformibus, rectis, anticè inclinatis, apud $\frac{2}{3}$ anfractuum diametris bifurcatis. Ventre latè rotundato, costato. Aperturâ reniformi. Septorum lobis lateralibus 4.

	<i>a</i>	<i>b</i>
Diameter of shell,	1 inch 6 lines.	
„ of outer whorl,	5 „	9 lines.
Thickness	$7\frac{1}{2}$ „	1 inch $1\frac{1}{2}$ „

Width of outer whorl = $\frac{2^8}{10^0}$ to $\frac{3^2}{10^0}$ of the diameter of the shell.

This shell is distinguished from *A. biplex* chiefly by its depressed whorls, and also by the greater width and comparative shortness of the saddles and lobes. The ornamentation of the shell is precisely that of *A. biplex*, and it is indeed possible that *A. torquatus* may be merely a variety of that species, but until specimens of intermediate form, &c., have been discovered, the distinctions I have indicated are too considerable to be disregarded.

11. AMMONITES SPITIENSIS, N. S., Plate II. figs. 4, 4a, 4b.

Diameter of shell, 2 inches 3 lines.

,, of outer whorl, 9 ,,

Thickness, 11 ,,

Width of outer whorl = $\frac{3 \frac{3}{10}}{10}$ of the diameter of the shell.

This Ammonite bears some resemblance to the *A. planula* of D'Orbigny, but is distinguished by the following characters—the whorls of the Spiti species are somewhat narrower, the ribs more flexuous, and arcuated towards the front instead of towards the rear in the ventral area, and the shell is crossed at intervals of rather more than half a whorl, by deep oblique sulcations bounded posteriorly by strong ribs. The sutures are identical with those of the *A. planula*, except that the ventral and superior lateral lobes of the Spiti fossil are equal in length, and it has but two minute accessory lobes, instead of 3, as figured by M. D'Orbigny.

12. AMMONITES GUTTATUS, Strachey, Plate IV. figs. 1, 1a, 1b.

A testâ discoideâ, compressâ. Anfractibus rotundatis, apud umbilicum crassioribus, tuberculato-costatis, 3 sulcis obliquis notatis. Costis numerosis, tenuibus, apud umbilicum 3, 4-fasciatis, apud ventrem, leniter anticè arcuatis. Ventre rotundato. Umbilico profundo, lato, tuberculis 20 coronato. Aperturâ semilunari? Septorum lobis lateralibus 6.

Diameter of shell, 2 inches 1 line.

,, of outer whorl, $9\frac{1}{2}$,,

Thickness, 11 ,,

Width of outer whorl = $\frac{3 \frac{8}{10}}{10}$ of the diameter of the shell.

Very closely allied to the preceding species, from which it is distinguished chiefly by the characters of its sutures; the lobes and saddles being $\frac{1}{3}$ longer, and the saddles narrower than in *A. Spitiensis*; while there are 4 conspicuous and 2 minute lateral lobes instead of 3 of the former, as in the above species. There are also some differences in the ornamentation, but how far these are constant I am unable to say. Thus, in *A. Spitiensis*, the ribs and tubercles are less numerous than in *A. guttatus*, and the sulci of growth are three to each whorl, and continuous in the former species, while in the latter there are barely 2 to the whorl. These latter differences I consider, however, to be unimportant, and should further specimens shew the sutures to be more variable than is usual

in Ammonites of the same group, there would remain no good reason for distinguishing the two forms in question.

13. AMMONITES HYPHISIS, n. s. Plate IV. figs. 2, 2a, 2b.

A. testâ discoideâ, compressâ, costatâ. Anfractus subquadratis, parum amplexantibus. Costis valdis, rectis; nonnullis (plerumque alternantibus) bifurcatis; medio ventre parum incisus, haud interruptis. Ventre planato. Umbilico magno: suturis impressis. Apertura reniformi. Septorum lobis lateralibus 4.

Diameter of shell,	1 inch 10 lines.
„ of outer whorl,	7 „
Thickness,	8 „

Width of outer whorl = $\frac{31}{100}$ of the diameter of the shell.

Intermediate in form between *A. communis*, and *A. Parkinsoni*, this shell is distinguished from the first by the mesial notching of the ribs which indicates an approach to the *Dentati*, (*Ornati* of Von Buch); and from the second by its continuous ribs, as well as by the inferior number of its lobes and their greater equality in size. Some of the ribs carry a small tubercle at the bifurcation, which occurs alternately on the opposite sides of the whorl. The collection contains two small specimens of this Ammonite, which are precisely similar to each other, and a fragment of a larger specimen $1\frac{1}{2}$ inches in thickness.

14. AMMONITES GERARDI, n. s. Plate II. figs. 6, 6a, 6b.

A. testâ subglobosâ, levigatâ, angustè umbilicatâ. Anfractus ventraliter subcompressis, amplexantibus; senioribus, radiatim latè undulatis. Ventre rotundato. Umbilico parvo, profundo. Aperturâ trigonâ, apud dorsum valde excavatâ.

	<i>a</i>	<i>b</i>
Diameter of shell	2 inches.	$3\frac{1}{4}$ inches.
„ of outer whorl	1 inch.	$1\frac{2}{3}$ „
Thickness	1 „ 2 lines.	$1\frac{1}{2}$ „

Width of outer whorl = $\frac{50}{100}$ of the diameter of the shell.

This Ammonite belongs to a group largely represented in the Triassic beds of St. Cassian, and of which one species only, *A. sternalis*, Von Buch, is described by M. D'Orbigny, Quensted and others from the Upper Lias of France and Germany.* To this species, *A. Gerardi* bears much external resemblance, but the sutural ramifications of the Spiti fossil prove it to be without doubt a distinct spe-

* Several species occur in the Cretaceous rocks of S. India.

cies. Moreover, from such fragments of shell as remain on one of our specimens, it appears that this was smooth in *A. Gerardi* as in the Triassic forms, whereas that of *A. sternalis* is ornamented externally with fine ribs.

The ventral lobe of the septa of *A. Gerardi* is extremely short, barely half as long as the superior lateral lobe, and is divided almost its entire length. The lateral lobes are nearly equal and fan-shaped at the extremity, and the saddles simple and compressed in form.

Four specimens are in the Gerard collection; one of the smaller, a distorted specimen, was figured in the Asiatic Researches; another is here represented. These are both young and do not shew the radiate undulations which characterize the adult shell.*

15. CERATITES? HIMALAYANUS, n. s. Plate II. figs. 7, 7a.

C. testâ discoideâ, compressâ, carinatâ, tuberculato-costatâ. Anfractibus amplexantibus, complanatis. Tuberculis internis apud $\frac{4}{3}$ anfractuum 10: externis apud peripheriam 20. Costis haud prominentibus, inæqualibus, plerumque bi vel tri-furcatis. Ventre anguste carinato, haud sulcato. Umbilico parvo; marginibus rotundatis. Aperturâ angulatè ovatâ, anticè complanatâ.

Diameter of shell,	1 inch	6 lines.
„ of outer whorl	9	„
Thickness,	7	„

Width of outer whorl = $\frac{5.0}{10.0}$ of the diameter of the shell.

The specimen of this shell in the Spiti collection, although in a very fair state of preservation, does not present so clean a surface on that part on which alone the sutures are visible, as could be desired for the satisfactory determination of the genus. There is, however, no trace of any foliation on the saddles, so far as they can be seen, while the lobes of one part are distinctly dentated like those of the typical *Ceratites*. It is clearly distinct from *C. Jaquemonti*, Von Buch, the only known Himalayan species of the genus, which according to its discoverer, whose name it bears, was found associated with *Ammonites bipher*, and a number of other Oolitic forms of *Ammonites*.

In form and ornamentation, *C. Himalayanus*, is closely allied to *C. Nodosus*, the type of the genus, but differs in its narrower ventral region and keeled periphery.

* The largest specimens were only discovered after the plates had been finished.

Class. GASTEROPODA.

16. TURRITELLA MONTIUM, n. s. Plate I. fig. 7.

Turritella? As. Res. Vol. XVIII. Part 2, p. 114, Pl. I. fig. 12.

S. testâ crassâ, conicâ, turritâ. Spirâ brevi, angulo 28°. Anfractibus angulatis, medio valdè bicarinatis, supernè obliquis, planatis: ultimo ad basin depressè rotundato. Suturis valdè excavatis. Aperturâ circulari.

Length of fragment,	1 inch 9 lines.
Total length of spire restored,	2 inches 9 „
Width of last whorl,	1 inch.
„ of peristome,	8 „

An obtuse thick-shelled species, with the upper and lower surface of the whorls bevelled towards the suture, ornamented with two spiral keels, the lower of which is the most prominent.

The collection contains three fragments of this species, the largest of which is figured in the Asiatic Researches, loc. cit. and also in the accompanying Plate I.

Judging from its appearance (mineral character) it is from the same beds as the Ceratite and *Ammonites Gerardi*.

17. PLEUROTOMARIA, sp. ? Plate IV. figs. 3, 3a.

Some fragments of casts of a small turreted species with sub-angulated whorls, evidently belong to this genus. The upper surface of the whorls is flattened and oblique, the base convex, and marked on the cast with 4 equidistant ridges, the interval between the posterior ridge, and the keel being twice as great as that between the ridges. Aperture sub-pentangular, rounded in front.

18. PLEUROTOMARIA, sp. ?

A flat Solarium shaped cast, much distorted by pressure, and water-worn, evidently distinct from the above.

Class. CONCHIFERA.

19. ASTARTE MAJOR, Sowerby.

Unio? and *Trigonia?* Herbert and Everest, Gleanings in Science, Vol. III. p. 272, Plate XVII. figs. 4a, b.

Unio? Everest, As. Res. Vol. XVIII. Part 2, p. 114, Plate II. figs. 26, *a*, *b*, *c*.

Astarte planata, Sowerby, Op. cit. p. 278.

Astarte major, Sowerby, Geol. Trans. 2nd series, Vol. V. Plate LXI. fig. 1.

This species, three specimens of which occur in Dr. Gerard's collection, is undoubtedly identical with the Cutch species named as above by Mr. Sowerby. The specimens are smaller than those from Cutch, but in form, only differ in that the anterior end is less truncated, and the length of the shell is somewhat less proportionally, than in the specimen figured in the Geological Transactions, which is stated to be somewhat *wider* (*i. e.* in the present terminology, *longer*) than the average. The measurements of our largest specimen are as follows:—

Length 2 inches 3 lines.

Height 1 inch 7 „

Thickness 1 „

20. CYPRINA? TRIGONALIS, n. s. Plate IV. figs. 4, 5.

C. testâ trigono-cordiformi, crassâ, sub-inflatâ, striatâ, anticè rotundatâ, posticè angulatâ, obtusè carinatâ. Area posteriori levigatâ. Umbonibus prominentibus.

Length 1 inch.

Height 10 lines.

A small trigonal shell, chiefly occurring as casts, and of somewhat doubtful genus. It is associated with *Avicula echinata* in sandstone.

21. NUCULA CUNEIFORMIS, Sowerby.

Modiola. Herbert, Glean. in Science, Vol. III. p. 272, Pl. XVII. figs. 5*a*, *b*, *c*.

Modiola. Everest, As. Res. Vol. XVIII. Part 2, p. 114, Pl. II. figs. 28, *a*, *b*, *c*.

Nucula. Sowerby, As. Res. Vol. cit. p. 275.

Nucula cuneiformis, Sowerby, Geol. Trans. 2nd Series, Vol. V. Plate XXII. fig. 4.

Most of the specimens of this shell are much crushed, and the valves being united, do not admit of examination of the hinge. A small cast, however, apparently identical, but probably from a different bed, shews that the shell is, as surmised by Mr. Sowerby, a *Nu-*

cula. Allowing for the distortion of the specimens, the form so closely resembles that of *N. cuneiformis* from the Cutch Oolites that I cannot hesitate to regard them as specifically identical.

Length	1 inch 1 line.
Height	7 lines.
Thickness	7 ,, approximately.

22. CUCULLEA VIRGATA, Sowerby.

Arca. Herbert, Glean. in Sc. Vol. III. p. 272, Pl. XVII. fig. 6.

Arca. Everest, As. Res. Vol. XVIII. Part 2, p. 114, Plate II. fig. 27.

Cucullæa virgata. Sowerby, Geol. Trans. 2nd Series, Vol. V. Pl. XXII. fig. 1.

The specimens of this shell are much crushed, so that their form is not accurately determinable, but it appears to be identical with the Cutch species, and is characterised by similar sharp radiating ribs, with lines of growth strongly marked towards the margins.

23. INOCERAMUS ?

A large concentrically-undulated shell, in bad preservation, appears to belong to this genus. Also a smaller fragment, marked with deep broad concentric furrows distinct from the above. The specimens are insufficient to admit of specific description.

24. MONOTIS CONCENTRICUS, n. s. Plate IV. figs. 6, 6a, 7.

M. testâ obliquo-pyriformi, inæquivalvi, anticè excavatâ, posticè rotundatâ. Valvâ sinistrâ inflatâ, concentricè undulatâ; umbone prominenti incurvatâ. Valvâ dextrâ convexâ, obliquè orbiculari; margine cardinali rectâ; concentricè striatâ, supernè angustè incisâ.

Length about 1 inch 3 lines.

Width 1 ,,

Thickness 7 ,,

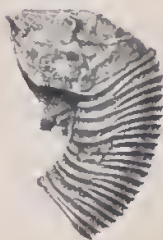
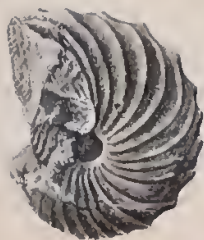
In form, and in the sculpturing of the left valve, much resembling *Inoceramus concentricus* of the Gault. The right valve resembling that of an *Anomia* in form, with a deep linear notch just under the hinge line. The specimens are not very perfect. They are embedded in a black siliceous stone, similar to that of the nodules in which the *Ammonites* are enclosed. They are associated with *Belemnites Sulcatus*.

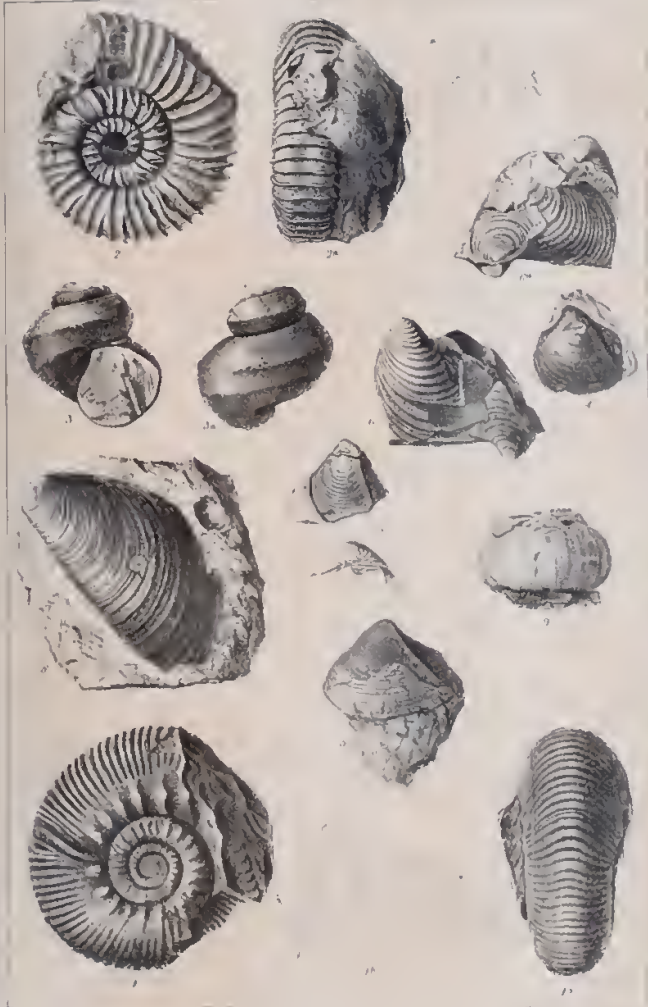


H F Stanford, del



J. P. Stanford, del.





25. *AVICULA ECHINATA?* Sowerby.

Some specimens of sandstone are full of the valves of an *Avicula*, which appears to be identical with this widely ranging Oolitic species. None of them are sufficiently perfect to enable me to identify them with certainty, but the form of the ornamented valve, and the sculpturing, so closely resemble those of the type specimens, that there is at least great probability of their identity. If any thing, the Spiti specimens are somewhat more orbicular than those of Europe, but they vary somewhat in form, unless I have confounded two distinct species; a question, which the state of the specimens does not enable me to decide satisfactorily.

26. *MYTILUS MYTILOIDEA*, n. s. Pl. IV. fig. 8.

M. testâ semiovatâ, elongatâ; anticè truncatâ, angulatè planatâ, rectâ; posticè rotundatâ; concentricè striatâ, haud costatâ.

Length 2 inches.

Height 1 „

This shell has precisely the form of the common *Mytilus edulis*. The umbo of the only specimen in the collection, is wanting.

Sub-kingdom. ANNULOSA.

Class. ECHINODERMATA.

27. *SALENIA?* Pl. IV. fig. 9.

An internal cast of a depressed spheroidal *Echinid* with narrow ambulacra, pores in simple pairs, broad interambulacra with five or six plates in each row, and a very large circular disc, the plates of which are not however distinguishable. As regards form it might be either a *Cidaris* or one of the *Salenidæ*, but the size of the disc is such that it can only be referred to the latter family. It seems improbable from its association with Oolitic forms that it should belong to the genus to which I have referred it provisionally (all the known *Salenias* being cretaceous), but the disc is much larger than any known species of the oolitic *Acrosalenia*.

LIST OF ILLUSTRATIONS.

Plate I.

Figs. 1, 2 *a-c*, Phragmacone and guard of *Belemnites sulcatus*,
Miller.

„ 3, 3*a* *Ammonites acucinctus*, Strachey.

- Figs. 4 Ammonites Wallichii, Gray ; *a*. suture.
 „ 5, *a—b*, Ammonites octagonus, Strachey ; *c*. suture.
 „ 6, *6a*, Ammonites Nepalensis, Gray.
 „ 7, Turritella ? montium, Blanford.

Plate II.

- Figs. 1, *1a—b*, 2, 3, Ammonites communis, Sow. See note, p. 124.
 „ 4, *4a*, Ammonites Spitiensis, Blanford ; *b*. suture.
 „ 5, Suture of Ammonites biplex, Sow.
 „ 6, *6a*, Ammonites Gerardi, Blanf. Sep. *b*. suture.
 „ 7, *7a*, Ceratites Himalayanus, Blanf.

Plate III.

- Figs. 1, *1a*, Ammonites Strigilis, Blanford.
 „ 2, 3, Ammonites Wallichii, Gray.
 „ 4, *4a*, Ammonites biplex, Sowerby ; *b*, *e* first and sixth sutures
 of the same Ammonite.
 „ 5, Suture of another specimen.
 „ 6, *6a*, 7, *7a*.—Ammonites torquatus, Sowerby.
 „ 8, Suture of the above.

Plate IV.

- Figs. 1, *1a*, Ammonites guttatus, Strachey ; *b*. suture.
 „ 2, *2a*, Ammonites Hyphasis, Blanford ; *b*. suture.
 „ 3, *3a*, Pleurotomaria.
 „ 4, 5, Cyprina ? trigonalis, Blanford.
 „ 6, *6a*, 7, Monotis concentricus, Blanford.
 „ 8, Mytilus mytiloidea, Blanford.
 „ 9, Salenia ?

*Remarks on the BACTRO-PALI Inscription from TAXILA.—By
Major-General A. CUNNINGHAM.*

Thirty years have elapsed since the first Bactro-Pali inscriptions were discovered by Ventura, Court, and Masson,—and during that long period but little progress has been made in their decipherment. Certain titles such as *Maharaja* and *Chhatrapa*, or “King” and “Satrap,” and particular terms, such as *Bhagavata S'ariva*, or “relics of Buddha,” *māta-pita*, or “mother and father,” *putra*, “son,” and *vihāra*, “a monastery,” have long been known; but the greater portion of these records still continued to baffle all attempts at any satisfactory rendering of their contents. Several of these inscriptions are dated, and so far back as January 1848 I was the first to make out the Hindu months of *Srāvana* and *Chaitra*, and during last year I succeeded in reading the names of the Macedonian months, *Artemisios* and *Apellaios*. The figured dates, however, still remained a riddle; but the recent discovery of Mr. Roberts's Taxila inscription, with its date written as well as figured, in characters much better defined than is usual in these cursive records has enabled Professor Dowson to unravel the mystery of the Bactrian numerical figures. I am indebted to the kindness of Mr. Grote for the copy of this inscription, which has been sent out to India by Mr. Thomas, with the avowed object of obtaining independent translations in anticipation of the receipt of Professor Dowson's rendering of the text.* The following is a version of such parts of this important record as I have been able to make out during the short period that I have had it before me. Although this rendering is imperfect, yet I would fain hope that it may still be of some service towards the object which Mr. Thomas had in view, when he forwarded the inscription to India. My discovery of the Bactro-Pali symbol used for the prefixed *r*, in such important words as *pūrvva*, *sarvva*, and *āchāryya*, and in the names of the Macedonian month *Artemisios*, and the Hindu month *Kārtika*, seems to me to be of sufficient value to warrant the publication of this translation, as it may assist more competent scholars hereafter in rendering versions of other inscriptions.

* Vide vol. xxxi. p. 532.

Transliteration.

Line 1. *Samvats'araye athasatatimae*, 20, 20, 20, 10, 4, 4, (= 78) *mahārāyasa mahatasa MOGASA*, *Panemasa māsasa, divase panchame*, 4, 1, (= 5) *etāye purvvāye, Chhaharasa* (line 2) *Chukhsasacha, Chhatrapasa LIAKO, KUSULUKO nāma, atasa patropati (?)* ** *Takhas'ilāye nagara utarena pacham des'o Chhema nāma atra* (line 3) *s'apatiko aprativadita BHAGAVATA S'AKA-MUNISA s'ariram patidharati (?) Sangha Rachite (na) sarvva Budhānam puyae, māta-pitaram puya, yuta* (line 4) *Chhatrapasa soputradārasa AYU-BALA-VARDHIKA bhrātara sarvva cha, satiga* ** *dharasa cha, puya, mahatana (?) patipatikasa* *** —(line 5) *Rohini gatrena ya imati Sanghārāma Kamika*.
On the back, *Patipasa Chhatrapa Liaka*.

TRANSLATION.

In the seventy-eighth year, 78, (in the reign) of the king, the great MOGA, in the month of Panemos, on the fifth day, 5, on this aforesaid date, (in the time) of LIAKA, Satrap of *Chhahāra* and *Chukhsa* (? Hazara and Chach, or Chach-Hazara of the present day) ——— in the north-western district of *Takhasīlanagara*, in (the village) named *Chhema*, (this monument) was made to hold relics of the matchless teacher, *Bhagavata Sakya Muni*, by Buddha Rakshita, for the benefit of all Buddhists, for the benefit of his mother and father, also for the benefit of the Satrap, together with the wife of his son AYU-BALA-VARDDHAKA, and all her brothers, and * * * *dhara*; also for the benefit of—(not made out down to the last two words) the monastery of *Nava Kamika*.

Notes on the inscription.

I. On the date. The number of the year is written thus, *athasatatimae*, which is evidently the Sanskrit *ashta-saptatitama*, or eight and seventy. The unit number also occurs, both written and figured, in the year 28, in Masson's Hidda inscription, and again in my Yusufzai inscription from Ohind, in the day of the month. In figures the date of the year is made up of six cyphers, namely 3 twenties, plus 1 ten, plus 2 fours, which together amount to 78. The number of the day of the month is formed in a similar manner, thus, 4 plus 1 = 5, which being preceded by the word *panchame*, or "fifth," leaves no doubt of the correctness of the value assigned to the symbol x. The name of the month is Panemos, which was the ninth of the Macedonian calendar. This is preceded by the words *Mahārāya-*

sa mahatasa MOGASA, which would appear to give the name and titles of the reigning king. The first word I take to be the same as *Maharaja*, as both terms are used indifferently in the Kapurdigiri inscription. The second word, *mahata*, or "great," is well known from the coins as the title of all the later kings both Greek and Scythian. The third word therefore can only be a proper name, which I take to be that of the reigning king. We have a similar mode of expression in my Yusufzai inscription from Panjtar. In this record the month is the Hindu Srâvana, during the reign of the king of the Gushân tribe (*Mahârâyasa Gushânasa*). The name of the king most probably followed the title, but has been lost by the breaking of the stone. I think it probable that the great MOGA of this inscription is the same as the great MOA, or MAUA, of the coins. If the real name was MAWA, it might have been written indifferently either as *Moa*, or *Moga*, as we find in the parallel case of the name of Gondophara, which is written both Undopherras and Gondophares on the coins.

Now the coins of Moas prove, by their superior execution, that he must have been one of the principal leaders of the Indo-Scythian tribes who overthrew the Greek power in India. Indeed the priority of Moas to all other Indo-Scythian Princes, whose coins we possess, is so clear, that it has been admitted at once by all who have examined the subject; but the precise date of his accession to power is still doubtful, although the period may be fixed with some certainty within the narrow limit of about thirty years. For this event the year 100 B. C. has been assigned by H. H. Wilson, and 120 B. C. by Professor Lassen, while my own chronological table, which was framed some twenty years ago, places it in 130 B. C. The mean of these three periods is 116 B. C. which is very close to the date of 126 B. C. assigned by the Chinese for the conquest of Kipin, or Kophene, by the great horde of the *Su*, or *Sakas*. Now if we suppose that Moas, or Moga, was the leader of a branch of the *Su* which settled in the Panjab, we may fix his date at a few years later than 126 B. C. or in about 116 B. C. as just suggested. According to this supposition the era in which the Taxila inscription is dated will be somewhere about 60 years earlier than 116 B. C. or B. C. 176; and the date of the inscription will be $176-78=98$ B. C. Now as the occupation of Transoxiana by the *Su* is stated by the Chinese to have

taken place in the first half of the second century before Christ, it seems to me not improbable that the era in which the Taxila plate is dated, may refer to this particular event. As the year 163 B. C. is quoted by Lassen from the Chinese authorities as the actual date of this conquest, I think that it may be accepted for the present as the most probable approximation to the era used by the Indo-Scythian Sakas. By adopting this starting point, the date of the Taxila inscription will be $163-78=85$ B. C.

In a recent number of this Journal, 1862, p. 425, mention is made of two small silver coins belonging to my cabinet, which are close imitations of the Oboli of Eukratides. The legend is in two lines * * OKO KOZOYAO; and as there is just sufficient room for two letters before OKO, I think it highly probable that the full name will turn out hereafter, when more perfect specimens are obtained, to be ΔIOKO, which is almost the same as that of the Satrap mentioned in the present inscription. These coins were found near Rawal Pindi, in company with a number of different types of Hyrkodes, and of a few of the barbarous imitations of the coins of Alexander and Seleukos. They appear to me to be about the same age as the coins of Kozola Kadaphes, or about 90 B. C.

But there is another name in the Taxila inscription, if I have read it rightly, which will also serve to fix the date of the record in the early part of the century immediately preceding the Christian era. According to my reading the name of the Satrap's son is *Ayu-Bala-Varddhaka*, "the strengthener of life," which possibly may have been the full name of *Azas*, or *Aya*, as he is called in the native legends of his coins. As *Liaka* was the Satrap of king Moas, there is no improbability in making the Satrap's son Ayu the successor of Moas on the throne of Taxila.

It now remains to fix the date which should be assigned to the *Gushân* era. The leader of this tribe, which is called also *Kushân*, *Khushân*, and *Korân*, was certainly Kozola Kadaphes, as in the inscriptions of all his coins he calls himself king of the *Kushân*, or *Khushân*, whilst on some of them his name is associated with that of *Hermæus*, who is allowed by all numismatists to have been the last of the Greek Princes. Kozola Kadaphes was therefore beyond all doubt the subverter of the Greek power in Kabul. The date of this event is assigned to 85 B. C. by Professor Lassen, and also by

H. H. Wilson, while my own chronological table places it somewhat earlier in about 105 B. C. The mean of these dates would be about 90 B. C. which may be accepted as the approximate date of this event. There is, however, another date connected with the history of the Gushán tribe which has perhaps even a stronger claim to be considered as the starting point of their national era. This is the date on which the king of the Gushán tribe subjected the other four tribes of the *Yuchi*, an event which, according to the Chinese, took place about 100 years after their first settlement in Bactria, or about 26 B. C. The king of the *Gushán* tribe is then said to have conquered Kabul, Gandhara and Arachosia, to which India was afterwards added by his successor. Now according to our present knowledge, the conquest of India can be assigned only to Kanishka, and his brother Hushka, or Huvishka,* whose coins are still found in great numbers on the banks of the Ganges and Jumna. The father of these two Princes would therefore have been the consolidator of the *Yuchi* power by the subjection of the other four tribes. But who was their father? In settling this point we have little, or nothing to guide us, except the inferences derivable from the coins. On these, however, all the authorities are unanimous in making Hima Kadphises the immediate predecessor of Kanishka and his brothers. It is probable therefore that he was also the father of these princes. The main objection to this assumption is the fact that Hima Kadphises does not inscribe the name of the *Gushán* tribe on his coins, as was done by his predecessor *Kozola Kadphises*, as well as by his successors, *Kanerki*, *Hoverke*, and *Bazwano*. But as Hima Kadphises does not inscribe the name of any tribe on his coins, there is a strong probability that he belonged to the same tribe as his immediate successors. By Professor Lassen, Hima Kadphises is assigned to 24 B. C.; by H. H. Wilson to the beginning of the Christian era, and by my own chronological table to 60 B. C. In fixing this date, I was influenced by the opinion that the consolidation of the *Yuchi* power under the king of the *Gushán* tribe, and the subsequent overthrow of the power of the *Su*, or Sakas, were not improbably connected with the defeat of the Sakas by Vikramaditya in B. C. 57. I think still

* Mr. Thomas has ascribed to Babu Rajendralal Mitra the suggestion that Huvishka of the Mathura and Wardak inscriptions is the same as the Hushka of Kashmir history. The suggestion was mine, and was published by me in the note which first made known the name of Huvishka.

that this conjecture is a plausible one, and I am therefore inclined to assign the easily remembered date of 57 B. C. as the approximate period of the consolidation of the *Yuchi* power under the *Gushân* tribe. This important event is also noticed by Trogus Pompeius, who says that the *Asiani* gave kings to the *Tochari*.* The *Asiani* I take to be the same as Strabo's *Pasiani*, and both the same as the *Gushan*, *Kushan*, and *Khushan* of the coins, and the *Kuei-shwang* of the Chinese authors.

I will now apply these eras to the other dated inscriptions which are accessible to me.

No. 1.—Manikyala inscription of General Court; see Thomas' Prinsep's Essays, Vol. I. Plate IX. The second line opens with the date as follows: *San, 10, 4, 4 (= 18), etaye purvaye, Maharajasa Gushâna * * ** and the last line gives the month and day, thus: *Kartikasa mâse divase 20*. "In the 18th year, on this aforesaid date, (in the reign) of king Kanishka of the Gushân tribe,—in the month of *Kârtika*, on the 20th day." Accepting B. C. 57 as the approximate period of the aggrandizement of the Gushân power, the date of this inscription of the reign of Kanishka will be 39 B. C. The local Satrap's name which occurs certainly twice and perhaps three times in this record, I read doubtfully as *Hovedarta*, of which the third letter is purely conjectural.

No. 2.—*Hidda* inscription, No. 13, Tope, Masson:—See *Ariana Antiqua*, Plate of Alphabet, p. 262—*Samvatsaraye athavis'atihi 20, 4, 4 (= 28) mâse Apilaesa ekavisatihi Di. 20.1 (= 21)*. "In the twenty-eighth year, 28, in the month of Apellaios, on the twenty-first day, 21." There is nothing in this inscription to show in which of the two eras it is dated; but as the earlier era of 163 B. C. would refer this record to B. C. 135 while the forms of the letters, even allowing for the cursive nature of the writing, seem to me to be of later date than the characters on the coins of the first Saka kings Moas and Azas, I conclude that the *Gushân* era is that which has been employed. The date of this inscription will therefore be $57 - 28 = 29$ B. C. The word *s'arira* (relics) occurs shortly after the date, and I observe the word *dharma* twice in the lower line, which ends with *puyae*, the local form of the well known word *punya*.

No. 3.—The *Wardak* inscription, of which a translation has been

* Reges Thocharorum Asiani.

given in this Journal by Babu Rajendralal Mitra. No doubt the general scope of the record has been determined by this first attempt at a complete translation; but I must demur to the Babu's reading of nearly every proper name, except those of *Bhagavata* and *Huvishka*, which had been previously deciphered by myself. I have other objections to make to the values assigned to several of the letters, but I will here notice only the words read as *pushae* and *asanthánam*, which should be *puyae* (for *punya*) and *acháryánam*. Both of these words will be referred to hereafter. This inscription opens with the date as follows:—*San* 20, 20, 10, 1, (= 51) *mása Artamisiyasa* hi*, 10, 4, 1, (= 15). “In the year 51, in the month of Artemisios, on the 15th ———”. One letter only is doubtful, although according to the form given to it in the copy, it should be *ste*, or perhaps *vri*. A similar character occurs again between the words *Vihára* and *Bhagavata*. The true form of the syllable *vri* occurs on my beautiful little bilingual silver coin of *Vrishni Raja*, and I at first thought that the word might be *vrihi*, or *vridi*, for *vridhi*, and that it might refer to the fortnight of the increasing moon. But if I have read the date of the Hidda inscription correctly, the days of the Macedonian months must have been numbered up to 30, as was done by the Macedonians themselves. If we might read *dwiti*, or *bati*, or some word meaning “second,” then the month would be Artemisios the second, which was the name given to *Daisios* by Alexander the Great shortly before his death.

No. 4 — *Yusufzai* inscription from Ohind, Cunningham—See Jour. As. Soc. Bengal, 1854, and Thomas's Prinsep, Plate X. fig. 2. This inscription opens with the date—*San*, 20, 20, 20, 1 (= 61) *Chetrasa Mahasa Divasa athamiti*, 4, 4 (= 8). “In the 61st year, in the month of *Chaitra*, on the 8th day” (= A. D. 4).

No. 5.—*Yusufzai* inscription from Panjtar, Cunningham—See both plates just quoted. This inscription also opens with the date. *San* 100 (?) 20, 1, 1 (= 122), *Sravanasa masa sudi prathame*, 1, *Maharajasa Gushánasa Ra* (or *Ta*) ——— “In the year 122 (?) on the first of the waxing moon of *Sravana* (in the reign) of the king of the *Gushán* ———.” The value of the figure for hundreds is doubtful; but as the power of the *Kuei-shwang* is said by the Chinese not to have lasted beyond the third century, this figure is most probably the symbol for 100. I confess, however, that in a Bactro Pali inscription dated after the beginning of the Christian era I should have

expected to have found the Bactrian letter *h*, the initial of *hat*, or "hundred," used as the symbol for 100, as we find in the western cave inscriptions, and on the Gupta coins.

In the Taxila inscription the words *etaye purvvaye*, "on this aforesaid" (date), follow immediately after the date; and I think that the same words follow the date in Court's Manikyala inscription. But in the Mathura inscriptions the form of expression is always *asya purvvaye*, as well as in the two copperplate inscriptions of king Hastina, published by Professor Hall. In another inscription, however, which I have lately discovered in the ruins of the ancient *Srāvasti*, the form of *etaye purvvaye* is used. Unfortunately the date of this inscription is lost, with the exception of the cypher for 10, followed by another cypher which could only have been a 4 or a 5, and which together no doubt formed the day of the month. The date of this inscription, however, is the only part that is lost. It is a short record on the pedestal of a colossal statue of Buddha the teacher formed of the red sandstone of Fatehpur-Sikri, and therefore most probably executed at Mathura. The name of *Sāvasti* is mentioned in this inscription, as well as the significant Buddhist terms, *Trepitaka*, *Bodhi-Satwa* and *Bhagavata*. The concluding words are

Kosambakuṭiya āchāryyānām Sarvastidinam parigrāhe,

that is "the accepted gift of the Sarvastidina teachers of the *Kosambakuti*," or upper storied hall named *Kosambakuti*. I found the ruins of *Srāvasti*, as I had already anticipated in a letter to Mr. Bayley written before I visited the place, in the ruined city now called *Sāhet-Māhet*,—*Sāhet* being the city, and *Māhet* the great *Jetavana* monastery adjoining it. In *Sāhet* I recognize the most corrupt form of *Sāvet*, for the Pali *Sāvatthi*, which was the spoken form of the Sanskrit *Srāvasti* or *Sāvasti*. I am happy to say that, on my recommendation the Governor-General has been pleased to direct that this important inscription shall be forwarded to the Society's Museum in Calcutta, and, if possible, the statue also.

I have noticed this *Srāvasti* inscription for the purpose of illustrating the Wardak inscription, of which the last line has been read by Babu Rajendralal Mitra as

esha vihāra asanthānam mahāsanghigana patigaha.

By my discovery of the true form of the prefixed *r*, I am able to read the third word as *āchāryānam*, by which simple change this pas-

sage of the record becomes quite clear and satisfactory, and in accordance with the concluding passage of the Srāvasti inscription just noticed. The translation of this passage is as follows, "This monastery is the accepted gift of the *Mahāsaṅghika* teachers." The *Mahāsaṅghikas* were one of the principal Buddhist sects, the followers of Kasyapa; and the *Sarvāstidīnas* (or *Sarvāstivādās*) were another numerous sect, the followers of *Rāhula*, the son of Sakya Sinha.

I may notice here that the oft-recurring word read *pushae* by Babu Rajendralal Mitra is properly *puyae*, for *punya*, the *y* being formed with a rounded head instead of the usual pointed one.

II.—*On the place.* I read the words *Chhaharasa Chukhsasa cha* as giving the name of the district of which *Liaka* was the Satrap, and in which the monument was situated. *Chhahara*, or rather *Tshahara* as it would be pronounced on the Indus, is very probably the original name of the modern Hazāra, and *Chukhsa* of the modern *Chach*. These two names are always joined together in speaking as *Chach-Hazāra*, and it is certain that the inscription was found in the district which is called by this joint name. With regard to the situation of the village I think that there must be some mistake in the copy of the inscription which reads *utarena prachu*, "in the North East," whereas Hasan Abdāl, the place of discovery, is to the North West of Manikyala, or Taxila. By dropping the tail of the *p*, which forms the letter *r*, the word *prachu* will become *pacham*, or West, and the description of the place will thus accord with the actual position of the site of discovery.

III.—*On the Satrap's name.* I have ventured to translate the term *Kusuluka*, as "Red," because I find that there are no less than three kings of the name of Kadphises, who are severally distinguished as *Kozola*, *Kara*, and *Hoemo* (or *Hima*). Where there were so many princes of the same name, it became a matter of absolute necessity to distinguish the one from the other by some characteristic epithets. In these names therefore I read the simple distinctive epithets of *Kazal*, قزل, Red,—*Kara*, قرة, Black—and *Handu* or *Handāl*, هندو White. The last term is of course connected with the Sanskrit *Hima*, and Tibetan *Hyun*, both of which mean snow. In Greek the name is written OOHMO, but in the native character it is simply *Hima*, which I translate as the "White," or the "Fair." Now as all three of these epithets are pure Turki words, the princes

who made use of them must have been of Turki race. This is of importance in the case of Hima Kadphises as we have no other direct proof as to whether he belonged to the *Su* or *Sakas*, or to the *Yuchi*, or *Tochâri*. I will now describe the coins of these three kings.

1st. *Kozola Kadphizes*. The coins of this Prince are of three kinds, of which those bearing the name of Hermæus in the Greek legend are most probably the earliest. This Greek legend is as follows ΒΑΣΙΛΕΩΣ ΣΤΗΡΟΣ ΣΥ ΕΡΜΑΙΟΥ, which I look upon as being a blundered copy of ΒΑΣΙΛΕΩΣ ΣΩΤΗΡΟΣ ΕΡΜΑΙΟΥ by a native artist who was ignorant of the Greek characters. This legend will therefore refer to king Hermæus himself. The native legend on the reverse has the name of *Kujula Kapsa*, with the title of *Kushâna Yatugasa*, or king of the *Kushan* tribe. This coin I look upon as having been struck by Kadphizes during the lifetime of Hermæus, a practice which we know to have been customary in these provinces. On another coin of the same size and types we read the same native legend, but with the Greek inscription altered to ΚΟΖΟΥΛΟ ΚΑΔΦΙΖΟΥ ΚΟΡ□□Α—that is struck in the name of Kadphises alone. The third kind of this Prince's money is a small copper coin, of stiff but neat execution, bearing the Greek legend of ΚΟΖΟΛΑ ΚΑΔΑΦΕC ΧΟΡΑΝ CΥ ΖΑΘΟΥ, and on the reverse the native legend of *Kujula Kaphsasa Sacha Dharmapidasa Khushânasa Yaturasa*.

The coins of *Kara-Kadphises* are of the well known Bull and Camel types, which are always of rude execution and in bad preservation. The Greek legends I can make nothing of, but the native legends appear to be always the same, although the words are disposed in two different ways. The whole of the native legend I have not yet succeeded in making out satisfactorily, but I have deciphered the beginning and the ending beyond all doubt.

Maharajasa Rajatirajasa Deva-putrasa———*Kara Kapsasa* “(coin) of the king, the king of the kings, the God descended———*Kara Kadphises*.” The undeciphered portion of the legend consists of three letters, and may possibly be *Kushâna*.

The coins of *Hima Kadphises* are the well known gold and copper pieces which bear the same unvarying legends in Greek and Bactro Pali characters. On the gold coins the Greek legend is simply ΒΑΣΙΛΕΥC ΟΟΗΜΟ ΚΑΔΦΙCΗC, which on the copper coins is

expanded into ΒΑCΙΑΕΥC ΒΑCΙΑΕωN CωTHP ΜΕΓΑC ΟΟΗΜΟ ΚΑΔΦΙCΗC. The native legend, which is the same on both coins, is as follows—

Maharajasa Rajatirajasa Sarvvalogai-s'urasa Mahi-surasa Hima Kadphisasa tradata. “(Coin) of the king, the king of kings, the lord of the Universe, the supreme lord, Hima Kadphisas, the Preserver.” The compound term *Sarvvalogais'ura* I take to be the same as *Sarvalokes'wara*, the lord of all worlds, the letters *k* and *g* being used indifferently in *Gushán* and *Kushán*. *Mahisura* may be either *Mahi + is'wara* = *Mahís'wara* the lord of the earth, or *Mahá + is'wara* = *Mahes'wara*, the great lord, but the meaning is much the same.

The only objection that strikes me to my rendering of the terms *Kozola*, *Kara*, and *Hima*, as distinctive epithets signifying Red, Black and White, is the fact that they are not translated in the Greek versions, but simply transcribed. I do not think, however, that this objection has much weight, as we know that the very same epithets when attached to the names of Gaelic chiefs, whether Scotch or Irish, are generally used in the original, as Roderick *Dhu*, *Rob Roy*.

IV.—*On the name of the donor.* The name of *Sangha Rakshita* was a very common one amongst the Buddhists, meaning “preserved, or cherished, by Sangha,” the third person of the Buddhist Triad. It occurs frequently in the Bhilsa and Mathura inscriptions. The name is followed by the words *Sarvva Budhánam puyae, máta pitaram puya*, “for the benefit of all Buddhists, for the benefit of his mother and father,” a form of expression which is common to all these donative records. It occurs in Major Pearse's Hazara inscription as *máta-pitu puyae*; and also in Masson's very perfect inscription on the brass casket found in No. 2 Tope at Bimaran. In this I read the donor's name as *Siva Rachita*, but his father's name is doubtful. The gift consisted of *Bhagavata sarirahi*, or “relics of Buddha,” *sarvva Budhánam puyae*, “for the benefit of all Buddhists. See Ariana Antiqua, Plate 2 of Tope discoveries, for this inscription, in which the final letter of *Budhánam* is omitted, but which is found in Prinsep's copy,—see Vol. I. Plate VI. of Thomas's edition. The peculiar form of the *y* in *puyae* induces me to read the four letters immediately preceding *Bhagavata* as *deya dharmā*, a “religious gift,” a form of expression which is common to most Buddhist donative records, whether found at Benares, at Mathura, or in the Western Caves.

Additional Note, 23rd April.

In the remarks on my Eusufzai inscription from Panjtār I have read the date as the year 122; the only doubtful figure being that for hundreds, which I have taken as 100 on the ground that the power of the Yuchi kings did not, according to the Chinese, last beyond the beginning of the 3rd century. Since writing these remarks I have referred to Gesenius, *Monumenta Phœnic.*, pp. 88, 89, where I find the fullest confirmation of the value which I have assigned to the centenary figure. The contracted word *San*, or "year," is followed by an upright stroke which in Phœnician as well as in Bactro Pali represents the unit 1. This is followed by a symbol, which in Phœnician, Aramæo-Ægyptian, and Palmyrenian is the index for hundreds, the two symbols together signifying simply one hundred, as 1 £ signifies 1 pound.

In the Phœnician scheme the units up to nine are represented by an equivalent number of upright strokes. That this was also the case in the original Bactro Pali scheme is rendered highly probable by the fact that the numbers 4 and 5 in the Kapurdigiri inscription are represented exactly in the same manner. But in the inscriptions under review an independent symbol has been adopted for the figure 4, and I would refer to India as the source from whence this figure was obtained, because in the Khalsi inscription the number 4, as I have already noticed, is represented by a St. George's cross, †, where the Kapurdigiri inscription has four upright strokes.

The Bactro Pali cypher for 10 is also derived from the Phœnician, and the cypher for 20 is merely a duplication of that for 10, one cypher being placed over the other, as in the Aramæo-Ægyptian and Palmyrenian numbers. A reference to Gesenius, pp. 88 and 89, will prove at once that the Bactro Pali scheme of numbers was originally the very same as that of the Phœnicians, and that it was afterwards slightly modified by the adoption of an independent symbol for the number 4, which was introduced from India.

Whether the Indians had a separate and original scheme of their own I am not prepared to say; but the symbols of the dates in the Mathura inscriptions, and on the Gujrat and Gupta coins, are quite distinct from those of the Bactro Pali inscriptions, even although most of them are simple Bactro Pali letters; as for instance the *h* which is the initial letter of the word *hat*, or "hundred."

I have re-examined my two small silver coins which I have attributed doubtfully to the Satrap *Liaka*. There are only three letters of the name remaining, which I have read as OKO; but a more careful scrutiny shows that there is a decided difference in the shapes of the first and third of these letters. The first letter is not only larger but it is also differently formed below, while the last letter, as well as the three *omikrons* in KOZOYAO, is simply a small plain circle. The first letter remaining on both coins can, I think, only be intended for an A. This difference in the shapes of the first and third letters seems to render my attribution of the coins to *Liaka Kusulaka* almost certain.

The Peshawar Vase inscription, of which two copies have kindly been sent to me by Mr. Bayley and Babu Rajendra Mitra, I read as follows.

*Sihilena Siha-Rachhitena cha bharatehi Takhasilæ As'a-thuva
pratithavito sarva Budhanam puyaë.*

“The *Asa* Stupa was erected in Taxila by Sinhila and Sinha-Rakshita, brothers, for the benefit of all Buddhists.”

The characters appear to be rather loosely engraved—I have therefore read *thupa* for *thuva*, and *pratithapito* for *pratithavito*.

The peculiar form of the *chh* in *Rachhitena* induces me to read the somewhat similar character in the Wardak inscription as *ch*, and to suggest that the words towards the end of the first line may be read thus :

*Agramatigra Vihara cha Thuva cha Bhagavata Sakya-muni Sari-
ram patidhareti.*

“Both the *Agramatigra* Vihâra and the Stupa were erected for the relics of Bhagavata Sakya Muni.”

*Note on Major General A. Cunningham's Remarks on the Bactro-Pali
Taxila Inscription.—By Bâbu RÂJENDRALÂLA MITRA.*

It is with some diffidence that I venture to offer a few remarks on the subject of the preceding paper. Entertaining the highest sentiment of respect for its author as one of the earliest and most successful antiquarians of India, I would never have, under ordinary circum-

stances, presumed to give expression to opinions opposed, even though but slightly, to his views. But the subject of Bactro-Pali inscriptions is involved in so much difficulty, and has as yet derived so little benefit from the researches of oriental scholars that I feel convinced that the following contribution towards its elucidation, insignificant as it is, will not be altogether useless to future enquirers.

To the general scope and purport of the Taxila inscription as interpreted by General Cunningham, I have no objection to offer. They accord pretty closely with a version that I had prepared on the receipt of the last number of the Journal, but which I could not, owing to want of leisure, complete, for presentation to the Society. I think, however, that some of the explanations and inferences of the General are evidently inadmissible. In the first line of the record he reads, after the name of the King Mogasa, the name of the Greek month Panemos, but as the only letters visible are *p*, *m* and *s*, with a blank between the *p*, and the *m*, the deduction is by no means such as can claim immediate confidence. In all the Ariano-Pali inscriptions that have hitherto been decyphered the words for month, year and day have all been taken from the Sanskrita. The system of naming days according to the moon's age is peculiarly Sanskritic, and the division of the month into the light and the dark halves of the moon, is of Indian or Sanskritic origin. *A priori*, therefore, one would expect that the Taxila tablet should have the name of an Indian and not a Greek month, and this expectation is strengthened by the fact that in the Manikyala inscription, the General has himself read the name of the seventh Hindu month *Kártika*; and we have his authority for the last Hindu month *Chaitra* in the Yusufzai inscription from Ohind, and for the fourth month *S'rávaṇa* in the Punjtar record from the same locality.

It is to be admitted that in the Hidda inscription he has read the name of *apellaios*, and in the Wardak vase, the word *artamiseyasa*, but those readings are yet open to question and cannot, therefore, be cited as authorities.

The Hidda record, according to the General, opens with the words,* *Samvatsaraye Athavisatihi* 20, 4, 4, *Máse apilasa ekavisatihi*, but on referring to the facsimile in the Ariana Antiqua (p. 262,) I find the only letters visible are 4, 4, *Máse apeusa chidasa*, the variants being *u* for *o* in the first word, and *j*, *t* or *v* for *u* in the second. The

* Ante, p. 111.

letters from "Samvat" to "20" do not exist in the original. The word *Mása* is doubtful, as the *m* has a mark at the bottom which is equivalent to an *o* or a *u*, and not an *á*, which is generally indicated by a horizontal or oblique line on the top and never by a stroke at foot, and it is impossible, therefore to read the first syllable as *má* without assuming an error either in the original or the facsimile. For *apilasa* we have a word which cannot by any possibility have an *l* in it, and for *ekavisatihi* I can find no equivalent syllables, regard being had to the known powers of the Arian alphabet.

In the Wardak record I followed Mr. E. C. Bayley in reading the letter* after the era *aṭha chitriyasa vrehi*. General Cunningham, in his correspondence with Mr. B. published in the last volume of the Journal (p. 303), found in those letters the words *artamisiyasa divasa vrehi* which, in the paper under notice, he has changed to *artamisiyasa hi*, dropping altogether the *vre* before *hi* and the *divasa* of his correspondence for which, however there was no equivalent whatever in the original.

I do not presume to deny the possibility of Greek months being named in a Bactrian inscription, for in India it is a common practice in the present day to use the months of one language in the writing of another, such as the English months in Bengali records both official and private, and such might have been the case in the days of the Baetrians in India, but finding that out of the five dated Baetrian inscriptions which have been hitherto discovered, three unquestionably have Hindu months, and the other two are only doubtful, I am disposed to think that it is unwarrantable to assume from a few disjointed syllables a Greek word in an Indian document, when an Indian term may be as easily supplied. Assuming the language of the record to be purely Sanskritic as I shall presently shew it to be, the missing syllable between the *p* and the *m* may be more reasonably supposed to have been an *ncha* than an *n* and in that case the word would be *panchamasa* or the fifth month and not *Panemos*.

The General has noticed the Greek word *Xanthicos* in an inscription discovered by Captain Robinson of the Engineers, but as it has not yet been published, I cannot venture to say anything in regard to it.

In the second line I take the word *etasa* to be the Páli form of *etasya* "of his" or "thereof," and *Patropati* to be a corruption of

* Ante, Vol. XXX. p. 346.

patra a car and *pati* "lord;" but owing to a lacuna after the last word its connexion with the subsequent word is not apparent.

In the third line General Cunningham has translated the words, *Sapatika aprativáda* "the matchless Teacher;" but upon what authority I cannot make out. *Sa* in Sanskrita means "happiness" or "felicity," and *patika* "lord," and the two together would make a very appropriate epithet for the founder of Buddhism whose great mission was to rid mankind of the threefold pain of disease, decrepitude and death, and clear the way to final beatitude. The second word is formed of the privative particle *a* and *prativáda* "an opposing argument," with the personal affix *itach*, which would make the whole phrase mean that "none could oppose him in argument." This is a very becoming predicate for S'ákya who has been repeatedly described in the Lalita Vistara and elsewhere as the most distinguished controversialist, from whom the Bráhmanic philosophers fled like jackals from a lion.

About the end of the third line occurs the remarkable word *Puyae*, written often and more correctly with an additional *y* as *puyaye*. In Sanskrita *puya* as a root means "to putrify," and as a noun *puya* indicates "pus," but in neither of these senses can it be used in the inscription. Apparently the word is the dative singular of *puya*, and the position it occupies requires it to imply some good or blessing for the parties named. Hence it is that General Cunningham takes it to be a corruption of *punya* or "religious merit" which he translates into "benefit." In the Wardak inscription the word occurs as *pus'a* but that has been attributed to a mislection on my part of the word *puya*. This, however, I am not willing to admit. The cerebral *s* in the Bactrian alphabet is formed of three lines making the three sides of a parallelogram leaving the bottom open, the *y* being formed of two lines shaped like a cone. Now in the Wardak record the last syllable of *puya* or *pus'a* is made of three lines shaped like a parallelogram, and this more than half a dozen times. General Cunningham, being well aware of it, says that "there they are formed with a rounded head instead of the usual pointed one." It must follow, therefore, that if the word there be *puya* and not *pus'a*, the error is due to the engraver of the original record, and not to the decipherer; and if an error of the kind be admitted, it is just as possible that it should be in the Taxila as in the Wardak monument, the only circum-

stance remarkable being that the word occurs several times in each document and always with perfect uniformity, *puya* in the one and *pus'a* in the other, with the most vexatious constancy. In an unpublished inscription on a steatite vase in the Peshawar museum,* the word appears as *puya*, not *pus'a*, and if this be permitted to incline the balance of probability in favour of that reading, I feel disposed to trace its origin to the Sanskrita root *puj* "to worship;" the *j* of the word being, by local or dialectic peculiarity, changed to *y*. In the present day the *y* in Uriah is invariably pronounced as *j*, and in Bengali it assumes the two forms of ञ and ञ़, the former being pronounced as *j* and the latter as *y*, though in the alphabet there is a separate symbol for *j*, and the ञ़ whether with or without the dot at the bottom, holds an only place at about the end of the series. The paṇḍitas of Bengal observe this distinction even in reading Sanskrita, and frequently quote an ancient verse in support of their practice.† The Nipalese follow the Uriah and pronounce their *y*, whether initial, medial or final, as *j*. According to Yajur Vedic scholars, the initial *y* should invariably be pronounced as *j*, hence the name of their Veda, though written with a *y*, is pronounced as Jajur. In the Kapur di Giri inscriptions the *y* has often been used in the place of *j* and the word *Rájá* changed to *Ráyo* offers a notable instance of the convertibility of the *y* and *j*. These analogies would go a great way to support my assumption of *puya* being a corruption of *puja*, and if this be admitted the meaning of *puyaye*, would be "for the purpose of worship." The supposition that it is a corruption of *punya* has not the support of analogy, for we know of no rule of orthoepy Sanskrita, Páli or Prákrita, which alone can govern the phonology of the Bactro-Páli, by which the sonant *n* can be elided for the benefit of the liquid *y*. The rule in the Prákrita is invariably to drop the semi-vowel and double the surd or the sonant with which it may be associated.

General Cunningham reads the four last syllables at the end of the third line *puya yuta*. I wish to alter them to *puyaye cha* to preserve the syntactic connexion of the clause in which they occur with that which precedes it. The last letter of the line is partially obliterated, and taking it therefore, for the sake of concord as *ch* and not as *t*

[* Vide ante, p. 151.—Eds.]

† पद्मध्मे पदान्ते च यकारः पथते बुधेः ।

पादादौ च पदादौ च जकारसमवाच्यता ॥

which it somewhat resembles, will not, I trust, be represented into a violence against the original.

The phrase *Saputra dárása Ayubalavarddhika* in the fourth line has been explained by General Cunningham as the "wife of his son Ayubalavarddhika," but the derivation of the first word of the clause being *sa* "with," *putra* "a son," and *dárá* "wife," its meaning should be "with his son and wife" and the *áyubalavarddhika*, if a proper noun, should be the name of the wife and not of the son. It might be made to correspond with the next word *bhrátara*, but cannot, in consonance with any rule of Indian Grammar, be made to jump over the wife (*dárá*) and correspond with the son (*putra*). I am disposed to take it for an invocation for the life (*áyu*) and health (*bala* lit. strength) of the satrap and his family. The only objection to this explanation is the fact of the phrase having no case-affix to indicate its connexion, but as such an expression in the Sanskrita would have taken the accusative case, and in the monumental Páli the mark of that case is often elided, the objection cannot be of any moment.

The last word of the 4th line—*pati patikasa*, has been left untranslated on account of a blot at its end. I think it may be derived from *patti* a "line of infantry," and *patika* "commander," and infer therefrom that the concluding word is a declaration in favour of some distinguished general.

Although unconnected with the inscription under notice, I avail myself of this opportunity to observe that General Cunningham's conversion into *ácháryánám* of my reading of *asanthánánám* of the Wardak vase is apparently a very appropriate emendation, being in perfect keeping with the S'rávastí record lately discovered by him; but unfortunately for it, it cannot be adopted without declaring one of the two *ns*, so distinctly visible at the end of the word, to be a redundancy.

My observations, I feel, are open to the objection that they are based upon too strict an adherence to the rules of Sanskrita grammar, and cannot therefore be appropriately applicable to the language of the Indo-Bactrians who must have used a mixed tongue, partly Indian and partly Bactrian. But inasmuch as a mixed language implies a mixture of words from different sources in one language, and not the formation of a new language by a combination of the formal elements of different tongues, which is unknown in history, no exception should be taken on the score of my having availed myself of the standard of

the Sanskrita for my guide. As far as I am able to judge from the meagre evidence at my command, the grammar of the Arian inscriptions is unquestionably of Sanskrita origin. Its declensions correspond with the Páli of the Cinghalese on the one hand and the Sanskrita on the other, and closely resemble the Páli of the As'oka records, of which most probably it is a dialectic variety. Like the Páli of As'oka, it has no case-affix for the nominative. The accusative in either is formed by an *m* or the omission of all case-mark just as we find it in the later Prákrita. In the modern Indian vernaculars of Sanskrita origin it is frequently omitted. The instrumental has *ena* both in the As'oka Páli and the Arian. In the Prákrita it changes into *hinto*. For the dative we have in both the dialects the same affix *e* or *ye*. The ablative has not yet been met with in the Arian. The genitive *sa* for the Sanskrita *syā* is common to the Arian, the Páli, and the Prákrita, while the *e* of the Sanskrita locative is almost universal in the Arian vernaculars of India both ancient and modern. In As'oka's Kapur di Giri monument it is represented by *si*, and in the Páli and the Prákrita by *mhi*.

Only a limited number of conjugational affixes have as yet been discovered in the Bactrian inscriptions, but they all assimilate to the Sanskrita more closely than to the Páli of the Cinghalese. The *ti* in *paridharati* and *viharati* of the Taxila and the Rawal Pindi records and the *tu* in *bhavatu* of the Wardak vase, are so identically Sanskrita, that if we had no other evidence to ascertain the relationship of the Bactro-Páli to the ancient classics of India, they would have sufficed to settle it with unquestionable certainty. Dr. Max Müller, talking of the English, says, "The single *s*, used as the exponent of the third person singular of the indicative present, is irrefragible evidence that in a scientific classification of languages, English, though it did not retain a single word of Saxon origin, would have to be classed as Saxon, and as a branch of the great Teutonic stem of the Arian family of speech." And if this argument in favour of grammar being the only criterion of the relationship and classification of languages be true, how strongly must it apply to the Bactro-Páli which, besides its grammar, has nearly the whole stock of its vocables taken from the Sanskrita? I say "nearly" to provide against the possibility of an erratic foreign element occasionally turning up, but as far as my knowledge of those records which have been already translated, is

concerned, I may with perfect safety use the more positive *wholly*. All the words of common life such as father, mother, brother, sister, husband and wife are identically the same in Sanskrita and the Bactro-Páli. The terms for superior, king, governor, master, servant, town, country, mountain and river, in the latter are all taken from the former; and the adjectives, pronouns and verbs, though occasionally altered and rounded by the attrition of use or the laws of phonetic decay, still retain enough of their pristine form to indicate most unmistakably their affiliation to the Sanskrita. Mr. E. C. Bayley, in his remarks on my note on the Ráwal Pindi inscription, has taken exception to the word *Mahi Sachya* which I assumed to be derived from the Sanskrita *Mahá Sachiva* "the great minister," and to two other words. But, admitting for the sake of argument, that they are unSanskritic, the fact will amount to this that there are three foreign nouns in a Sanskritic composition, which can no more affect its character than the scores of Bengali or the thousands of Latin in the English, affect its Teutonic origin. The same may be said of proper names, a great many of which could not but be foreign in a record put up by foreigners in India. The grammar is unquestionably Sanskritic, and that being the blood and soul of the language, it is but reasonable and fair that, in decyphering records in that language, half effaced on mouldering monuments, and written in characters whose powers are not yet fully known, and several of which may be mistaken for half a dozen different letters, the enquirer should seek in the Sanskrita for a key.

It is no doubt remarkable that the language of the Bactrian inscriptions, put up by conquerors in a foreign land, should retain the purity of the native dialect, and be altogether free from the admixture of vocables imported from the speech of the dominant race. It is, indeed, but natural to suppose that those who introduced their alphabet amongst their subject nation should likewise introduce their language; and the contrary is a matter of surprise. But the difficulty vanishes when it is borne in mind that the inscriptions under notice were monumental records, and care was therefore taken to compose them in the purest of vernaculars, and that the Bactrians at the time had not had sufficient opportunity to infuse their language into the current speech of the country.

Mr. Bayley is of opinion "that a foreign element was strong in the trans-Jhelum districts" between the 3rd century before, and the 2nd

century after, Christ ; that this “ may be guessed from the familiar names of men and places which are certainly for the most part any thing but Páli or Hindee ;” and “ that the language of their common use must be *primá facie* expected to partake of a similar character.” This argument has led him to the inference that the language of As’oka’s edicts is a “ quasi religious” or “ sacred dialect” and not the current vernacular of his dominions. The first of these two positions may be readily admitted as possible or even probable, but the latter does not seem to be at all connected or dependent upon the other. What we have to deal with is the dialect as we have it before us, and not what it should be. Now a careful examination of the language of the As’oka edicts, clearly shews that it is a stage in the progress or growth of the Sanskrita in its onward course from the Vedic period to the vernaculars of our day, produced by a natural process of phonetic decay and dialectic regeneration, which can never be possible except in the case of a spoken dialect. Professor Max Müller, adverting to these changes, justly says, they “ take place gradually but surely, and what is more important, they are completely beyond the reach or controul of the free will of man.” No more could As’oka and his monks devise them for religious purposes, than change the direction of the monsoons or retard the progress of the tides. It is said that Marcellus, the grammarian, once addressed the emperor Tiberius when he had made a mistake, saying, “ Cæsar, thou canst give the Roman citizenship to man, but not to words ;”^{*} and *mutatis mutandis* the remark applies with just as much force to As’oka as to Tiberius. There can be no doubt that As’oka was one of the mightiest sovereigns of India. His sway extended from Dhauli on the sea board of Orissa to Kapur di Giri in Afghanistan, and from Bakra in the north-east to Junagar in Guzerat. His clergy and missionaries numbered by millions ; they had penetrated the farthest limits of Hindustan proper, and had most probably gone as far as Bamian on the borders of the Persian empire. Religious enthusiasm was at its height in his days, and he was the greatest enthusiast in the cause of the religion of his adoption. He devised his edicts to promote that religion, had them written in the same words for all parts of his kingdom, and used exactly the same form every where ; but with all his imperial power and influence he could not touch a single syllable of the grammar which prevailed

* Apud Max Müller, Science of Language, p. 37.

in the different parts of his dominions. In the North West the three sibilants, the *r* above and below compound consonants, the neglect of the long and short vowels, and other dialectic peculiarities, rode rough-shod over the original as devised by him and his ministers and apostles in his palace, and recorded in Allahabad and Delhi; while at Dhauli nothing has been able to prevent the letter *l* entirely superseding the letter *r* of the edicts. Had the language under notice been, as supposed by Mr. Bayley, a "quasi religious" or a "sacred dialect," it would have been found identically the same in all parts of India, for the characters used in the Delhi, Allahabad, Dhauli and Junagar records are the same, and if uniformity had been sought, it could have been most easily secured. But popularity was evidently what was most desiderated, and therefore concessions were freely made in favour of the vernaculars of the different provinces at the expense of uniformity. Unless this be admitted, it would be impossible to explain why the word *Rájá* of Delhi, written in the same characters, should in Cuttack change into *Lájá*. Had the language been a sacred one intended for the clergy only, no such concession would ever have been required. The Sanskrita of the Brahmanic priesthood is alike everywhere, and so is the Latin of the Roman Catholic clergy. It is the people whom As'oka wished to address, and accordingly adapted his language to the capacity and the idiom of his hearers. The differences which have resulted from this concession to the *genius loci* of language have been pointed out at some length by Prinsep;* and they have confirmed the opinion of Wilson,† Thomas,‡ Lassen§ and others that the Páli of the edicts was the vernacular of India at the time of As'oka, and that the peculiarities under notice are the dialectic differences of the different provinces where they occur. By that vernacular it is of course meant to be the language of writing and of the higher orders of the gentry, and in the same sense in which the language of the Parliamentary speeches and of the leaders of the *Times* newspaper would be called the vernacular of England. The common people no doubt spoke dialects of very different degrees of purity in much the same way as we notice dialectic differences in almost the different streets of London from the back slums of St. Giles to Belgravia. All who could read and write could understand the

* Ante VII. p. 220 et 279.

† Journal, Royal Asiatic Society, XII. p. 236.

‡ Thomas's Prinsep, II. p. 44.

§ Essai sur le Páli, p. 15, et Institutiones Linguae Prakriticae, p. 60.

language of the edicts, and those who heard it read out could likewise understand it, and that is all that is intended to be said in regard to its vernacularity.


Philologically considered the language of the edicts is intermediate between the Sanskrita on the one side and the Prákrita on the other. Lassen says, "que le Prákrit altère plus le Sanskrit que ne le fait le Páli, et qu'il offre en quelque sorte, le second degré d'altération, comme le Páli en est le premier et le plus immédiat." And inasmuch as the Bactro-Páli bears the closest resemblance to it with a leaning towards the Sanskrita, we cannot but assign to it a Sanskritic affiliation, and in decyphering it therefore the safest guide appears to us to be the Sanskrita. Hence it is that the more we assimilate it with Sanskrita, the more readily does it become intelligible, while all attempts to decypher it on the hypothesis of its being a mixed language, have hitherto proved completely fruitless.


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*On Ancient Sanskrit Numerals.—By Dr. BHAU DAJI, of Bombay.*

Some time ago I read before the Bombay Branch of the Royal Asiatic Society a paper on ancient Sanskrit numerals, which will, I believe, appear in that Society's Journal in a year or two. As I think the discovery of the correct value of the numerical symbols is important, perhaps this brief abstract will be deemed worthy of publication in the Journal of the Asiatic Society of Bengal.

In deciphering the inscriptions in the caves of western India, especially those at Nassick, I found many numerical symbols the value of which was at the same time given in words. And as many of them are repeated sometimes in the same series of inscriptions, sometimes in others, without presenting any difference, there cannot possibly be a doubt of the correctness of the following results. The sym-

bol for one hundred is  that for two hundred is represented by one

side spur stroke added to the former  that for three hundred is re-

presented by two side spur strokes . The symbol for four hund-

red has not been found. Strange to say the symbol for 500 is not 4 placed after the symbol for 100, but the number 5 itself joined.

The symbol for 1,000 resembles the Marathi figure for one ; the addition of one side spur stroke doubles its value, and of two side spur strokes trebles it as in the case of the hundreds. Four thousand are represented by the figure 4 being joined to the symbol for one thousand ; and the figure 8 is joined to represent eight thousand. There is a symbol apparently for 5,000, the spelling of which is indistinct. The following are most of the numerical symbols with their spelling in words.

*Nassick cave No. 23 of Mr. Brett's plan.\**

|      |      |     |              |                          |
|------|------|-----|--------------|--------------------------|
| Line | 3rd  | १   | सतानिबे २००  | two hundred (200.)       |
| "    | "    | २   |              |                          |
| "    | 6th  | ४ १ | सवहरे १८     | in the 18th year.        |
| "    | 10th | १   | सत १००       | one hundred.             |
| "    | 11th | ३ ५ | सवहरे २४     | in the 24th year.        |
| "    | 12th | ८   | दिवसे २०     | on the 10th day.         |
| "    | "    | १   | सवहरे ४      | in the 4th year.         |
| "    | "    | १   | दिवसे पचमे ५ | on the 5th day.          |
| "    | "    | ८   | पख ?         | in the (?) demilunation. |

*Cave No. 16.*

In a newly discovered inscription regarding the Abhir dynasty.

|      |      |            |                                              |                     |
|------|------|------------|----------------------------------------------|---------------------|
| Line | 10th | ३ = द्वे २ | two (2.)                                     |                     |
| "    | "    | ४ २ २      | क्रषापणसइखः (?) thousands of Karshapanas (?) |                     |
| "    | 11th | ५          | सतानि पञ्च थ०                                | five hundred (500.) |

*Cave No. 8.*

Inscription by the wife of the Commander-in-Chief Yudnashri Satakarni.

\* Journal, Bombay Br. As. Soc., Vol. V.

- Line 1st ऽ सवहरे सातमे in the year seven (7.)  
 " " = पखेततीथं ३ in the demilunation three.  
*Cave No. 16.*  
 " " ५ = वसे ४२ or ९२ in the year forty-two (42) or ninety-two (92.)  
 " 2nd ५ सहस्राणि त्रीणि ३००० three thousand (3000.)  
 " " ५ २००० 2000 (no spelling in words.)  
 " 3rd ५ सहस्रा णिव २००० Karshapanas two thousand (2000.)  
 " " ९ १००० 1000 (no spelling in words.)  
 " 4th ९ सहस्रा णि पठ ८००० Nandigur currency, eight thousand (8000).  
 " " ५ वसे ४० or ९० in the year forty (40) ? or ninety (90).  
 " " ५५ वस ४५ forty-five (45.)  
 " 5th ५५ five (?) thousand (?) Karshapanas.

Last line which has been extended under another inscription for want of space \* \* \* \* Karshapanas four thousand (4000).

*Cave No. 23.*

In another inscription of Gotamiputra.

- Line 1st ५९ सवहरेत्रकुनवीसे in the nineteenth year (19).  
 " " = पखेबितौथे in the second demilunation.  
 " " ५९ = द्विवसे तेरसे १३ on the thirteenth (13) day.

*In another inscription below.*

- Line 2nd ५३ सव १९ Suva (Sumvatsun) or year nineteen (19).  
 " " = मिव २ Gi. Pa. two (2) (*i. e.* Gimha Pakheh) in the second demilunation in the summer season.

” ”  $\text{ॠ} \equiv$  दिव १३ diva thirteen (13) (*i. e.* on the thirteenth day.)

Line 3rd  $\text{१}$  दिव ७ diva seven (7) *i. e.* on the seventh day.

*Cave No. 24.*

Line 1st  $\text{६}$  सवदरे कटे ६ in the sixth (6) year.

*Karlen Cave.*

In an inscription of the mendicant Harapharan the son of Satapharan.

Line 1st  $\text{२४}$  चतुर्विसे २४ in the year twenty-four.

” ” in the 3rd demilunation.

” ” on the second day.

*In Somadeva's inscription.*

Line 1st in the 7th year.

” ” in the 6th demilunation.

*In Padamāvi's inscription.*

Line 1st in the 5th demilunation.

” 2nd on the 1st day.

*In a Chaitya cave at Junner on the Bhima Shunker hill, at its middle, the following numbers are to be found.*

Line 2nd, 15 (no spelling.)

” 4th, 1:  $\text{८०}$  10 (?) [the symbol  $\text{८०}$  resembles somewhat the letter  $\text{८}$  in the Vallabhi copper plates.]

*In cave No. 1 in the inscription of an officer of Ushavadāt.*

Line 4th  $\text{४६}$  in the year 46 (?)

*Kanheri cave, No. 30.*

Line 9th, two hundred (200.)

*Cave No.*

Line 1st, in the year seven hundred and ninety-nine (799).

*In the Junnagur inscription of Rudradama.*

Line 4th, in the year of Rudradama, seventy-two (72).

*In the Vallabhi plates.*

$\text{३९१}$  = 391.  $\text{३७५}$  = 375.  $\text{३४६}$  = 345 (395).

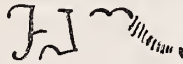
$$\text{𑀓𑀭} = 380. \text{𑀓𑀭𑀮} = 310. \text{𑀓𑀭𑀮𑀮} = 342.$$

$$\text{𑀓𑀭𑀮𑀮} = 385. \text{𑀓𑀭𑀮𑀮𑀮} = 35 \text{ (7 or 9.)}$$

*Bhilsa inscription, No. 7.\**

$$\text{⊕} = 93.$$

*Inscription 2nd.*





A very old inscription in the cave character at the top of the Nannah ghat near Junnara contains a great number of numerals, but their value is not given in words. It records gifts of cows (or perhaps their value in coins) horses, elephants, carts, sapakas (a particular coin) and perhaps clothes. There is one numerical symbol in it which I cannot at present exactly make out. The gifts were made at a great variety of Yadngas or Vedic sacrifices and a study of these will, I trust, enable me to discover their true value.

A correct decipherment of the inscriptions having enabled me to ascertain the true value of the various numerical symbols, it struck me that there would now be no difficulty in reading the exact dates on the Sáh coins of Suráshtra; on looking at these, it appeared that both Mr. Prinsep and Mr. Thomas had read the first numerical symbol in the place of hundreds as if it did not vary in any of the coins; but it was clear to me that in some, the symbol was the plain one for 100, and in others for 200, accordingly a correct reading of those dates would, I thought, enable a Numismatist to arrange the Sáh dynasty in chronological order; I therefore repaired to our learned Vice-President, the Honorable Mr. Newton, whose acquaintance with the Sáh coins is minute and accurate, and would not be surpassed. In going over the large and beautiful collection of coins in his cabinet, the arrangement according to the dates as I now read them, agreed in a most remarkable manner with that which Mr. Newton had already drawn up from a most careful study of the coins for several years. I therefore left the subject of the Sáh coins, their

\* Journal, Asiatic Society, Bengal, Vol. VI. p. 454.

date and arrangement in the able hands of Mr. Newton who will no doubt furnish a luminous paper on the subject. I have placed about three hundred Sáh coins of my own collection at his service and have now only to offer a few remarks on the era in which I think the Sáh coins are dated.

In former papers read before the Bombay Branch of the Royal Asiatic Society, I have attempted to identify the Padamávi of the inscriptions with the Siripulomávi of Ptolemy; and Swámi Chastana, the grandfather of Rudradámá, with Tiastenes, king of Ujjayini, noticed by the same geographer. I placed Rudradámá at the end of the second century of the Christian era, and as we have got a coin of his son bearing date, apparently 104 

and some of his grandson's bearing date 107  the only era which would place Rudradámá's son at the end of the second century is that of Salivahana or Sakanripakála, which commences 78 years after Christ. The Nasick inscriptions in particular, show that the Satrap Náhapúna who preceded Padamávi, and Ushavadáta, who is called a Saka, adopted an era, which counted in their time under 100 (either 42 or 92). I am therefore inclined to look upon it as the era of Kshaharáta or Phrahatas, one of the Arsacidæ, whose satraps they were. The Sáh coins are also Satraps; the type of their coins is that of the Arsacidæ and not that of the Bactrian Greek kings. The very expressions S'akanripa or Saka-king which all the old copper-plates and manuscripts have, indicates a S'aka or Scythian king. The S'akanripakála is observed over a great part of India, in Burmah, Java and Báli; in fact in those countries to which Buddhism was carried from India at the commencement of the Christian era; and corresponding to the spread of the Sakas or Scythians over this peninsula. It is not likely, therefore, that the era prevalent over so large a portion of the globe was derived from the exploits of a humble prince Saliváhana, whose capital was Paithan on the Godáveri, as is commonly supposed. Indeed the word Saliváhana does not occur in any ancient records or manuscripts. A Salaváhana dynasty appears to have reigned at Paithan about the time that the Scythian Satraps ruled over Guzerat, a portion of the Dekhan and the Konkan; and the utmost that can be granted is, that the Hindus of modern times have preferred calling the era of the great Saka-king by the name of



a contemporary Hindu prince at Paithan. I now begin to entertain serious doubts about the Vikramáditya era also. I believe that era too was introduced by the Buddhists or rather the Jainas, and that it corresponds to the victory obtained by Mithridates over the Roman general Crassus, 53 years before Christ. When we remember that there is a difference of four years between the Christian era and the birth of Christ, we can easily understand the Vikramáditya era being dated 57 years before Christ; but I hope to return to this subject at length on another occasion.

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LITERARY INTELLIGENCE, CORRESPONDENCE, &c.

Dr. Sprenger writes to Mr. Grote from Paris, March 24th.

“I frequently had heard complaints that there was little doing at Paris in oriental literature. As far as the study of Arabic and Persian is concerned I would not say that they are just. On the contrary I find that the pursuits of the new generation of orientalisists have taken a new and better turn. Instead of dwelling on grammatical subtleties and illustrating notes by notes, they enter into the subject. Without underrating the merits of oriental authors, they are not blind to their faults and endeavour to give us an idea of the condition of the east in bye-gone ages, considering language as a means to attain this object. To this school belongs the grandson of a man who was of a very different turn of mind—de Sacy. It is impossible to overrate the beneficial influence of M. Mohl, he is *au fait* on every topic, indefatigable, frank and ready to assist each and every one in his studies. To his endeavours the ‘Collection d’ouvrages orientaux’ is due, the plan and execution of which leaves nothing to desire. M. Schafer who has spent the greater part of his life in diplomatic service at Constantinople and Teheran, and who has visited Yaman, has collected a number of MSS. of the existence of which I had not an idea, as the *جمهرة* of Ibn Kelby the leading work on the genealogy of Arabic tribes, the *صفة جزيرة العرب* the best book on the geography of Arabia, the *انساب الاشراف* of Baladzory which treats on the history of the noble families of the empire of the Khalifs from Mohammad to his time, including a biography of the prophet which I have found quoted no where except in the Içába—so rare it was in the east;—and three works on the *خراج* or system of revenue, of which only one had been

known previous to his discoveries. In fact every book in his collection is a gem. It appears that Constantinople is after all the place where the best MSS. are to be found, and we must allow that Schafer was the man to select what is valuable. He is an excellent linguist and I hope he will find time to publish some of the materials which he has brought to Europe bearing on the history of eastern civilization, for this seems to have been the main object which he had in view in making his collection. You know Barbier de Maynard's *dictionnaire Geogr.*, it is made on the sound plan on which Sir H. Rawlinson intended to translate *Yáqút*. He intends to give us an edition of *Ibn Khordadba*, having discovered a MS. at Constantinople. It is the basis of oriental geography and every word which *Ibn Kh.* says is drawn from official records and therefore valuable. *Reinaud* has shown me the first proof sheets of a work which will interest you—on the knowledge which the Romans had of the far East, particularly India and China. *Wöpke* is advancing in his important labour, and will besides soon present us an essay on the history of the Arabic cyphers, which will exhaust the subject. *Garcin de Tassy's* correct edition and elegant translation of the '*Mantic at Tair*' you have of course seen. He is the only and the fittest man to explain to us the system of the *Çufies*, and it is to be hoped he will continue in this useful career.

You ask whether I am going on with *Moqaddasy*. I shall soon surprise you with a small treatise on geography containing the itineraries of oriental authors, illustrated with maps founded upon *Byrúny* and the *Atwál*. It is intended to supply the place of good maps and enable travellers to find out the spot of ancient cities which exist no more. I believe I mentioned to you that the indefatigable *Wüstenfeld* is going to publish the large geographical dictionary of *Yáqút*. Though *Yáqút* was no more a geographer than *Abulfeda*, the book will be useful on account of the excellent extracts which it contains. I forgot to mention that *Slane* has nearly completed the second volume of *Ibn Kháldún*. This book can only be compared with *Montesquieu's* '*Esprit des lois*,' but it is more philosophical and better founded on facts. *Slane* was the only man able to translate so difficult a work. *M. Schafer* read to me yesterday at breakfast the advertisements of new books published in Constantinople. Among them is the *Itqán*, I wonder whether they have reprinted our edition.

I told Wöpke that the advice of Babu Rajendralála Mitra would in many instances be of great use to him in identifying Sanskrit terms, and I hope he will apply to him, if he should need it.

If you should not succeed in finding a sufficiently good copy of the *Tabakáti Násiry*, you might publish *رامین و وایس*. It is a poem which has been translated from the Pehlewy by Nitzámy 'Arúdhly. There is a copy, I believe an unicum, in your Library. It was complete, but the book-binder finding it troublesome to mend the leaves has thrown away some. I should not mind this defect but publish it as it is. As far as I can judge, it is, after the *Shahnáma*, the most important work in Persian literature. As it contains a very great number of obsolete words, care must be taken that it is not modernized by a native editor. The labour of editing is not great, there is only one copy, and consequently no MSS. have to be collated, and the original is beautifully written. All that is necessary is to compare carefully the proof-sheets with the original, you would therefore have little expense on this account.

I talked to Mohl regarding the publication of *Ramyn and Ways*, and he agrees with me in recommending it as one of the most useful works."

Dr. Weber writes to Mr. Cowell, dated Berlin, April 9th.

"I have to thank you for your edition of the *Kaushítaki-Upanishad*, and the Society for the continuation of the splendid series of the *Bibliotheca Indica* (Nos. 175—185, new series 14—30) and of its *Journal* (Nos. 1—4 of 1861 and of 1862).

The difference of the texts of the *Kaushítaki-Upanishad*, and the curious state of its wording in several places, is a very interesting fact. *Vináyaka* in his commentary to *Sánkháy*. (= *Kaushítaki*) *bráhmána* V. 5 quotes the first two chapters of the *Áranyaka* (which are closely followed in our MS., Chambers 6770 by the *Upanishad*) as the 31st and 32nd *Adhyáya* of the *bráhmána* : तद्यथादो व्यवहितमेकत्रिंशद्द्वान्त्रिंशाध्यायोच्यमानं सौमस्य महाव्रतम् एवमेवैतद्विद्विमहाव्रतं महाहविरिति : the *adas* of the text certainly refers to the *Somasya mahávrata* as a later part of the work. On the other hand *Varadattasuta Anartíya* in his commentary to the *Sánkháy-S'rauta Súra* 13, 15, 1 quotes them by the title *Áranyaka* : महाव्रतस्यैवमादि यदारण्यकोत्तं तदाहरन्ति कुर्वन्ति सन्निष्ठाः. Both commentators quote several times a *Mahá Kaushítaki bráhmána*. *Anartíya* tells us (at 14, 2, 3) that the

adhyáyas 14—16 of the sūtra, which bear the appearance more of a bráhmaṇa than of a sūtra, are an *Anubráhmanam*, extracted by the Kalpakára from the *Mahákaushítaka*, एवं तर्द्धनुब्राह्मणमेतन्महाकोपीतकादाहृतं कल्पकारेणाध्यायत्रये. And Vináyaka adduces the same at several passages as varying from the text which he comments. The deeper looks we get into the literature of the bráhmaṇas and the sūtras, the clearer we see, that the apparent fixedness of their texts is but a secondary one, that we have in them only the last stage of a long and multiform development.

I am now in possession of a copy of two very good MSS. of the Taittiríya Sanhitá (formerly in the possession of Eug. Burnouf) pada and sanhitá, and I have in mind to give a transliteration of it in Latin type in the Indische Stud., in the same manner as Aufrecht's Rik, but joint with the various readings from the Káthaka and the White-Yajurveda.—Vol. 8 of the Indische Stud., which is now in print already, is to contain two metric treatises of my pen, 1, die Vedischen Nachrichten über Metrik, 2, Pingala's chhandah sūtra with copious introduction and with additions from the Vrittaratnákara, &c. Professor Whitney has given in the Journal of the American Oriental Society, an edition of the Atharva Prátis'ákhyá, with notes (I have not yet seen it, but presume the best) and one of the next numbers will contain the Taittiríya Prátis'ákhyá. Professor Kern is about to set off for Benares: he takes with him his long and elaborate studies and collections for an edition of Varáhamihira's bṛihat-sanhitá: he will no doubt find new materials in Benares, and your Bibliotheca Indica would be the right place for this most important publication. Professor Bühler (Elphinstone College, Bombay) has finished his essay on the As'vins and is busy with an edition of Gobhila's grihya sūtra with Náráyana's commentary.

Mr. F. E. Hall is reprinting Wilson's Vishnupurana with notes. The 3rd volume of the selected works of Professor Wilson, edited by Rost, and containing Wilson's smaller essays on the Puranas, is to appear in the course of the summer. We have now got here through Trubner and Comp. London, good and comparatively cheap prints from Bombay.

Mr. M. Bréal, Paris, has given a very clear and lucid essay on comparative mythology, "Hercule et Cacus," which is full of interesting detail. The Petersburg Worterbuch goes on steadily; the last proof sheet reached to पर्माडि. Of Böhtlingk's collection of

“Sprüche” the first volume (अ-न) is now ready. Dr. Friederich has left with us before he resailed for Batavia, a decipherment and translation of a curious inscription on a Manjus’rī statue.”

Dr. Weber also writes to Bábu Rajendra Lala Mitra.

“Your translation of the Chhándogya Upanishad and the introduction to it deserve all praise: in the latter, however, there are some points in which I cannot quite agree with you. The four new Bráhmaṇas of which you speak at pp. 15, 16, are nothing but the VII. VI. I. and II. Káṇḍas of the S’atapatha Bráhmaṇa, as you will easily verify from my edition of it: the names hasti, ushá, havyan and ekváí are corruptions for hastishaṭ (or hastighaṭa,) ukhásambharaṇa, haviryajno and ekapádiká. It is a pity, that you have not joined the text of the first two chapters of the Chhándogya Bráhmaṇa, (pp. 17, 18,) to this your translation of the eight following adhyáyas. Their context refers to the gr̥ihya ritual and its knowledge would be I guess of value for the understanding of the corresponding part of the gobhilagr̥ihyasútra (see Indische Studien, V. 368 ff.). Professor Buhler (Elphinstone College, Bombay) is now busy with an edition of this sútra, and he would no doubt be very thankful to you for a communication of the text in question. We long very much for the conclusion of your valuable edition of the Lalita-Vis-tara and for the continuation of the *text* of the Taittiríya Bráhmaṇa, the third káṇḍa being of much interest on account of its containing the enumeration of the victims at the as’wamedha and the purushamedha sacrifices (compare Váj. Samh. 24—30.) The only copy of it, which I knew till lately in Europe, is very corrupt: but they have in Paris, as I learned some time ago, a very excellent copy, formerly in the possession of Eug. Burnouf.

Aufrecht’s edition of the Riksanhitá in Latin type is now finished, and will be hailed by all engaged in our studies with much fervour. He has also composed a complete Index of all the words contained in it, together with an indication of all the passages, where they occur. But as yet he is not decided when and where he will publish it. His catalogue of the Sanskrit MSS. of the Bodleian is finished in print, excepting the indexes: and these will be completed he hopes in the course of this year. We shall have then before us a most excellent work, a real mine of literary intelligence not to be found any where else.”

Dr. Max Müller has been delivering a second course of Lectures on the Science of Language at the Royal Institution; the following is the programme.

LECTURE I.—*Saturday, February 21st.*

Introductory Lecture—On the Method of the Science of Language.

LECTURE II.—*Saturday, February 28th.*

On Sound and Meaning.

LECTURE III.—*Saturday, March 7th.*

On the Physiology of Articulate Sounds.

LECTURE IV.—*Saturday, March 14th.*

On the Causes of Phonetic Variation.

LECTURE V.—*Saturday, March 21st.*

On Grimm's Law.

LECTURE VI.—*Saturday, March 28th.*

The Principles of Etymology.

LECTURE VII.—*Saturday, April 18th.*

The Principles of Etymology.

LECTURE VIII.—*Saturday, April 25th.*

On the Powers of Roots.

LECTURE IX.—*Saturday, May 2nd.*

On Metaphors.

LECTURE X.—*Saturday, May 9th.*

On Ancient Religion.

LECTURE XI.—*Saturday, May 16th.*

On Ancient Mythology.

LECTURE XII.—*Saturday, May 23rd.*

On Modern Mythology.

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#### POSTSCRIPT.

We have just received the following emendation from General Cunningham of his reading of the inscription on the Peshawur vase, (vide *suprà*).

*Nynce Tal, 4th June, 1863.*

This morning I have received a copy of the inscription from Mr. Lowenthal through the kindness of Colonel Maclagan. This copy shows an important difference in the reading of one letter, namely *y* for *s*, which gives at once a simple and intelligible meaning to the record. Instead of *Asa thuva*, the "Asa Stupa," the new reading gives *aya thuva*, "this Stupa."—On a closer examination perhaps a dot will be found after the *y*, thus making the word *ayam*.

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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR MARCH, 1863.

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The monthly General Meeting of the Asiatic Society of Bengal was held on the 4th instant.

Lieutenant-Colonel H. L. Thuillier, President, in the chair.

The Proceedings of the last meeting were read and confirmed.

Presentations were received—

From Captain A. K. Comber, Debrooghur, a fine specimen of the head and horns of the Takin (*Budorcas Taxicolor*).

2. From Captain E. Smyth, Futtehgur, the skins of the following animals :—

2 Thibet Ravens.

1 „ Owl.

1 Large Ovis Ammon (female).

1 Young Ovis Ammon (male).

1 Snow Leopard (the Ounce).

1 Thibet Wolf.

2 „ Hares.

3. From Mr. F. K. Dunbar, a specimen of the Red-tailed Tropic Bird (young) (*Phaeton Ætherus*).

4. From Babu Rajendra Mallika, a specimen of the Singapore Fruit Pigeon.

5. From Mons. Garcin de Tassy, a copy of his translation into French of a Persian work entitled *Mantic Uttair* of Farid Uddin Attar.

6. From Major J. Stevenson, Deputy Commissioner of Tavoy, the skull of a Dolphin, found at the mouth of the Tavoy river, and the skin of a Hog-fish.

7. From the Secretary Imperial Society of Cherbourg, through the French Consul at Calcutta, a copy of Vol. VIII. of the Memoirs of the Society.

8. From Colonel C. S. Guthrie, a bag prepared from the bark of the Jack-tree.

The following gentlemen duly proposed at the last meeting were balloted for and elected ordinary members :—

The Right Hon'ble Sir Charles Trevelyan, K. C. B. ; the Hon'ble A. Eden, C. S. ; Bábu Hurry Doss Dutt ; Captain G. Hunter Thompson, Staff Corps ; and H. M. Rogers, Esq., C. S.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

Major C. L. Showers, proposed by Mr. Grote and seconded by the President.

Dr. H. Cleghorn, Conservator of Forests, Madras, proposed by Dr. Anderson, and seconded by Dr. Fayrer.

Captain D. MacDonald, Revenue Survey Department, proposed by Major J. L. Sherwill, and seconded by the President.

R. S. Ellis, Esq, C. S., C. B., proposed by Captain W. N. Lees, and seconded by the President.

C. Robertson, Esq., C. S., Banda, proposed by Mr. Bayley, and seconded by Mr. Atkinson.

John Stephenson, Esq. B. A., Educational Department, proposed by Mr. H. Woodrow, and seconded by the President.

Dr. Gordon, C. B., Inspector General of H. M.'s Hospitals, proposed by Captain Lees, and seconded by the President.

The Council reported that they had appointed Mr. E. C. Bayley a Vice-President and Mr. H. F. Blanford a member of their body *vice* Colonel Strachey, who had left Calcutta for the North-Western Provinces.

Communications were received—

1. From Mons. R. de Schlagintweit, a paper entitled *Alphabetical list of the Hot Springs of India and High Asia*.

2. From the Assistant Secretary to the Government of India, Foreign Department, extracts from a Report on the Dependency of Bustar, by Captain Glasfurd, Deputy Commissioner of the Upper Godavery District, in the Central Provinces, containing an account of the architectural remains in that region, accompanied by copies of certain inscriptions referred to therein.

3. From the Under-Secretary to the Government of India, Home Department, copy of a communication from the Superintendent of



Port Blair, giving an account of further intercourse with the natives.

Mr. Bayley mentioned that intelligence had since been received, that the friendly intercourse here reported had been suddenly interrupted, and an unfortunate conflict had occurred in which a European sailor and a number of the Aborigines had been killed.

4. From Captain Montgomerie a letter on the subject of employing properly trained natives to explore countries beyond the British frontier.

The letter was read by Major Walker as follows :—

*Camp Ladak, July 28th, 1862.*

TO THE SECRETARY OF THE ASIATIC SOCIETY, CALCUTTA.

SIR,—I have now the honor to address you with reference to my proposal, for employing natives in the exploration of countries which are not as yet accessible to Europeans.

I think that for Central Asia, the Mahomedans from our North Western frontier are most likely to supply the best recruits. For Great Thibet and other countries, it may, from time to time, be found expedient to train a different class.

The observations, &c. to be made by such natives should be as simple as possible. The instrumental equipment should be compact and not include anything of a complex character. I should propose the following as the primary objects of their explorations.

1st.—The latitudes of important points.

2nd.—The heights of ditto.

3rd.—A rough route survey from point to point.

4th.—An account of each march and of each remarkable place visited.

For the above I think the following instruments would be sufficient, *viz.* :—

1st.—A sextant and artificial horizon or some instrument adapted for taking the altitude of the Polar Star, Sun, &c.

2nd.—A small boiling thermometer to determine the heights of places.

3rd.—A pocket compass with clinometer.

4th.—A good chronometer watch.

The above skilfully used, and the results honestly recorded, would at any rate give us an intelligible idea as to the whole of Eastern Turkistan.

Mahomedans of our North-Western frontier are constantly in the habit of crossing from Ladak into Yarkand, going from thence *via* Kashgar, Kokan, Bokhara, and back by Kabul. The advent of such a party from Ladak would be taken as a matter of course and would excite no suspicion.

If we only got the latitude and approximate height of Yarkand and the other cities of Eastern Turkistan, the result would be very valuable as we are in doubt as to the latitude and height of that portion of Central Asia. As yet the height has been deduced solely from speculations derived from the products of the country, but the great difference between the climate of places in the same parallels of latitude in India and China renders the resulting heights vague.

From the conjoint observations of the compass and watch checked by the latitudes &c., for the direction and time occupied on each march, I should hope that we would also gain a very fair idea as to the longitude of the various places. The natives, moreover, could give us a general account of the country and of the nature of each march. The compass might also be provided with a clinometer so as to give a general idea of the slope of the roads.

The great difficulty of the above scheme is of course, to obtain reliable natives capable of undertaking such journeys and with sufficient nerve to venture into such regions, and who can at the same time be taught to use the instrument efficiently and to record the results accurately.

At present I know of but one man\* fitted for such work and who would require a little training, but I do not think it would be very difficult to get one or two more from Peshawar or elsewhere, who might be trained to the work in a few months. After being trained, the party should first make some experiments in a country which we already know accurately, and as soon as the results prove equal to our expectations, arrangements should be made for an expedition into an unknown territory, and I should propose Eastern Turkistan for the first expedition.

The Nakshabandi Fakir Kwajah Ahmed Shah, who lives in Kashmir, is constantly in the habit of travelling in Eastern and Western Turkistan. He is, at the present moment, I understand, in Yarkand.

\* Mirza Sujjad, who was employed by Major Walker on the Peshawar Frontier Survey.

His son, Gafur Khan, who accompanied him in 1852-53 from Kashmir *viâ* Ladak to Yarkand, Kashgar, Kokan and back by Kabul, is now in Kashmir; both father and son have, in their clerical character, considerable facilities in moving about Turkistan, where the mass of the population is Mahomedan, and where the Shah (the son) tells me they have a good many followers (*mureed*) of their own, and would consequently not be likely to be interrupted in their travels.

I should propose that either the father or son should be asked to undertake the guidance of two trained native explorers, and I understand from the son that they would be willing to undertake such a charge. He said that he thought that there would be no danger to natives, who accompanied him into Turkistan.

In order to carry out the above it would be necessary to be provided with funds for training the explorers. Say, first man on Rs. 80 and two apprentices on Rs. 20 each per mensem, to be increased when employed in actual exploration to Rs. 100 and Rs. 30 respectively with travelling allowance of say Rs. 10 and Rs. 5 besides, or in all Rs. 110 and Rs. 35 when exploring. The Syud in charge might be given another Rs. 100 per mensem or a present at the end according to the way in which the exploration was effected, guaranteeing him a minimum of Rs. 50 per mensem.

Instruments might be provided in duplicate as far as the watch, thermometer and compass are concerned. It would take, say eight months to train the natives. The exploring party might leave Kashmir on 1st May next. They would reach Yarkand early in July and might spend July, August, and part of September in exploring Eastern Turkistan and return to Kashmir by the beginning of November. They would be out for eight months in the expedition, the expense would hardly exceed Rs. 300 per mensem, even if the head explorer was accompanied by both the apprentices. Their work could be tested by Trigonometrical values right up to the Karakoram pass.

The pay of the Syud and of the explorers would of course have to be separately arranged. I mention the sums above, simply in order to give the best idea I can as to the cost.

The men should be trained at the Head Quarters of the Grand Trigonometrical Survey, or at the Head Quarters of one of the Great Trigonometrical Survey parties.

If the apprentice who accompanied the first explorer turned out

well, he might eventually be put at the head of a second party, and a third apprentice might be trained and explorations made in various other directions as required. After Turkistan, I should recommend exploration to the eastward of the Paukong Lake District, a third in the Lassa direction and so on, but in each case I should recommend that explorers be accompanied by some reliable man\* who has been in the habit of visiting the countries in question. For instance I should think if an expedition is ever sent to Kokan, the Moola Abdul Majeed, who took the Governor-General's letter last year, might be able to take care of the explorers.

The exploration of all the country from Peshawar viâ Kabul and the Sirikol Lake to Kokan would have been a capital commencement, as for more than half the distance we could have tested the explorers' work by Lieutenant Wood's route to Sirikol.

With a small number of trained explorers available, the Asiatic Society would be justified in asking the Government of India to allow them always to send one or more native explorers with such expeditions as the last to Kokan whenever it was considered safe and expedient to do so.

Recommending the subject to the consideration of the Council of the Society,

I have, &c.,

(Sd.) T. G. MONTGOMERIE, Capt. Engrs.

1st Asst. G. T. Survey of India, in  
charge, Kashmir Series.

Major Walker expressed a strong opinion in favour of the plan suggested, and entered into various details as to the best mode of proceeding in case the scheme met the approval of Government, as well as to the time necessary for training natives for such duties. He remarked that the positions of certain places not far from our northern frontier, were uncertain to a very considerable amount of longitude, and that it would be easy to check the large differences now existing in the values of some places of note, as recorded by different authorities, if Captain Montgomerie's plan was carried out, and the native explorers were trained and instructed and their observations and routes checked properly, as he would take care they should be.

\* Mahomed Amin who accompanied Herr Adolphe Schlagintweit and his brothers, would be an excellent man for all parts of Turkistan. He knows the country thoroughly and moves through it at his pleasure.

The President remarked that the question was one of considerable interest and importance to the Society ; it had been submitted for the approval of the Government with the warm support of the Survey Department, but no orders had yet been received. He trusted that the Society would co-operate and add the weight of their influence in inducing the Government to contribute the small means necessary to carry out the measure. When they referred to the new map of Central Asia lately constructed under the direction of Major Walker, and published in the Surveyor General's office here, and observed the comparatively short distance between the British and the Russian frontier, the growing importance of a better geographical knowledge of the intervening countries would be apparent. It was a most remarkable fact that up to the present time, our geographical explorations beyond the British Frontier in almost every direction round Hindustan, were lamentably limited ; this was specially the case on the North-East frontier round Assam, and the valley of the Brahmapootra river, owing to the persevering hostility of the hill tribes against all Europeans. The employment of qualified natives of India, therefore, appeared to present almost the only means, at present likely to be of any avail, and he, therefore, looked hopefully for much good to arise from the present movement.

5. From Baboo Gopinauth Sein, abstracts of the results of the Hourly Meteorological Observations taken at the Surveyor General's Office in December last.

6. From the Under-Secretary to the Government of India, in the Public Works Department, a copy of Major General Cunningham's diary as Archæological Surveyor to the Government of India, for the month of December, 1862.

Extracts from Major General Cunningham's abstract printed report of his proceedings as Archæological Surveyor to Government of 1861-62 were read and commented upon by Mr. Bayley.

The President stated that the proceedings of the Archæological Surveyor to Government were of the first importance to the Society, and looking to the interesting contents of the two printed abstract reports which were only intended as mere diaries to satisfy the Government as to the progress made, the ultimate value of Major General Cunningham's researches might be inferred. Doubtless when his work was matured and published, it would prove a most valuable

record of their Society. It was obvious that the history of the ancient remains scattered over this Presidency could not be in better hands. He proposed that the special thanks of the meeting be conveyed to the Government for communicating these reports, accompanied by an intimation of the very high value which the Society places on Major General Cunningham's researches.

The President announced that on the application of the Director of Public Instruction, the Council had granted the use of the meeting-room for a course of geological lectures to be delivered by Mr. H. F. Blanford, and had also permitted the use of such rock specimens and fossils from the Society's collections as might be required to illustrate the lectures.

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FOR APRIL, 1863.

The monthly General Meeting of the Asiatic Society of Bengal was held on the 1st instant.

Lieutenant-Colonel H. L. Thuillier, President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From Major J. T. Walker, a set of photographs of views in Kashmir, prepared by Captain Melville.

2. From Captain Melville, a set of photographs, illustrating the hill tribes on the Peshawur frontier.

3. From the Assistant General Superintendent, North-Western Provinces and Oudh, a parcel containing *Dhatoora Stramonium* in its different forms, as used by the poisoners of Upper India.

4. From A. Grote, Esq., a copy of the first annual report of the Acclimatisation Society of Victoria.

5. From the same, a centipede (*Scolopendra morsitans*).

6. From the Assistant Secretary, Government of India, a copy of the Surveyor General's Report for 1858-59, 1859-60, 1860-61.

7. From Major C. L. Showers, a copy of his letter to Thomas Bazley, Esq., M. P., on the cotton question.

8. From Mr. N. S. Maskelyne, a copy of his paper on the fall of Indian Aerolites, published in the January No. of the *London and Edinburgh Philosophical Magazine*.

9. From the Vienna Museum, through Mr. Oldham, a box of meteorites.

10. From the British Museum, through Mr. N. S. Maskelyne, a small collection of meteoric stones and irons, and a fine series of models of aerolites which have fallen in India.

Mr. Oldham thought the fact of these beautiful casts of Indian aerolites being on the table, rendered this a desirable opportunity for the Society to take cognizance of the hearty co-operation and aid they had received from Mr. Maskelyne, the chief of the Mineral Department of the British Museum. He presumed that a formal acknowledgement would as a matter of course be sent to the Trustees of the British Museum for the specimens sent in acknowledgement of the valuable series which the Society had sent to London. But he thought the Society would fail in its duty, if it did not also acknowledge the obligations it was under to Mr. Maskelyne for the zealous and hearty care he had devoted to the examination and preparation of the specimens.

It would be in the recollection of the Society that some time back, they had sent to the Vienna Imperial Mineral Cabinet some specimens of aerolites, duplicates of their collection, and that subsequently they had sent to the British Museum all their meteorites to be cut and portions retained in the National collection. They were now in possession of the specimens sent by both those Institutions, in return for the Indian series.

The first collection forwarded from Vienna was unfortunately lost by the wreck of the ship in which it had been despatched. To replace this a second had been made, which, although necessarily not quite so valuable as that first sent, was still an excellent series. It contained eight varieties of meteoric stones, and ten of meteoric irons.

The series selected by Mr. Maskelyne of the British Museum contained fifteen varieties of stone meteorites, and nine of irons. The two together made a total of 23 varieties of stones and 19 of irons. But in these two series there were duplicates of eight falls, so that deducting those, the Society now possessed in addition to its own original series of the Indian meteorites, and to the very beautiful casts of other Indian stones now on the table, good typical specimens of twenty meteoric stones and 14 of meteoric irons.

He might add that the Geological Museum possessed about 45 different varieties of meteorites, so that the Calcutta collections, if aggregated, contained about 95 good specimens of meteorites. This

would place the series among the best of second class collections of such objects.

He had the pleasure of more than once going over all these specimens with Mr. Maskelyne last year, during a brief visit to London, and he could testify to the zeal with which their wishes had been carried out. He therefore proposed that the thanks of the Society be tendered to Mr. N. S. Maskelyne for the care and skill he had devoted to the examination and preparation of the specimens of meteorites for the Society's Cabinet.

The motion was seconded and carried unanimously.

11. From Col. C. S. Guthrie, four MSS. in Persian.

Mr. Cowell remarked that these MSS. were a valuable acquisition to the Society.

They were—

1.—A well-written copy of the *Kashful-Mahjúb*, a work on Sufi philosophy.

2.—The *Diwán-i-Haider*, a very rare MS., but unhappily damaged by the corrosive character of the ink employed by the copier. There was no copy of the work in the Society's library, but in Dr. Sprenger's catalogue, mention is made of a *Diwán* by Haider of Herat, which corresponds to the present volume.

3.—*Diwán-i-Sáib*.

4.—*Ruk'át-i-'Alamgiri*, a volume of the letters of the Emperor Aurangzib. There were three collections of the Emperor's letters, of which one had been printed (*Kalamát-i-Taibat*). This was a different collection, and did not seem to be in the Society's collection.

On the motion of the President, the thanks of the meeting were voted to Colonel Guthrie, who was present.

A letter from Mr. H. Braddon, intimating his desire to withdraw from the Society, was recorded.

The nominations of Mr. E. C. Bayley to be a Vice-President, and of Mr. H. F. Blanford to be a member of the Council, vice Colonel R. Strachey, were confirmed.

The Council reported that they had appointed the Hon'ble H. S. Maine, a member of their body in the place of the Hon'ble C. J. Erskine, who had left Calcutta.

The following gentlemen, duly proposed at the last meeting, were balloted for and elected ordinary members :—



Major C. L. Showers ; Dr. H. Cleghorn ; Capt. D. MacDonald ; Hon'ble R. S. Ellis, c. s., c. B. ; C. Robertson, Esq., c. s. ; John Stephenson, Esq., B. A., and Dr. G. Gordon, c. B.

The following gentlemen were named for ballot as ordinary members at the next meeting :—

Lieut. H. R. Thuillier, Royal Engineers, first assistant G. T. Survey, proposed by the President and seconded by Lieut.-Col. Gastrell.

H. D. Robertson, Esq., c. s., Saharunpore, proposed by Mr. Grote and seconded by Mr. Atkiuson.

P. W. Wall, Esq., c. E., F. G. S., proposed by Mr. Schiller and seconded by Mr. H. F. Blanford.

W. H. Stevens, Esq., proposed by Lieut.-Col. Gastrell and seconded by Mr. Leonard.

Dr. J. Tyler, proposed by Dr. Fayrer and seconded by Mr. Atkinson.

Hon'ble E. P. Levinge, proposed by Mr. Grote and seconded by the President.

W. Edgar, Esq. B. C. S., proposed by Mr. Blanford and seconded by the President.

The Secretary announced that the Catalogue of Mammalia was now ready for issue, price Rs. 2.

Communications were received—

1. From the Secretary to the Government of India, Public Works Department, forwarding a memorandum by Major General Cunningham containing proposals for carrying on excavations at certain localities examined by him during the last year, and informing the Society that His Excellency the Governor-General in Council had authorized the Governments of Bengal and the North-Western Provinces to carry these proposals into effect.

Mr. Bayley read extracts from Major General Cunningham's memorandum, and made some remarks on the subject of his proposals.

2. From Babu Gopinath Scin, an abstract of the result of the hourly meteorological observations taken at the Surveyor General's office, in January last.

Dr. Anderson read extracts from a paper by Dr. Stewart on the Peshawar valley, having special reference to its *flora*.

Mr. Oldham moved that the paper be referred to the Committee

of papers, to be considered with a view to publication; Dr. Fayerer seconded the motion.

The motion was opposed as an unnecessary interference with the discretion of the Council. It was explained that the paper had already been dealt with by the Council in the usual way and that it would be published in due course. The motion had reference to a difference of opinion that had arisen in the Council as to the mode in which supervision should be exercised over the Journal, a minority being of opinion that no paper should be published without a distinct vote of the Council on a report from the Committee of papers. The Council having agreed that their present practice fulfilled all the requirements of the rules and insured all the necessary supervision over the editorial management of the Journal, it was contended that their decision should be accepted until it was formally overruled upon a motion regularly made after due notice given. After a lengthened discussion, the following amendment was finally carried on the motion of Mr. Grote:—

That the present practice of editing the Journal is in harmony with the Society's rules, as explained in the following note, and that it is expedient to adhere to it.

NOTE.—Editing our Journal is one of the specific duties imposed on our Secretaries by Rule 88, and Rule 99, which declares the Journal to be 'under the superintendence of the Council,' does not, as I read it, claim for the latter any greater power of interference than Rule 74 which entrusts to it the 'direction, management and execution of the Society's concerns.'

The Secretary Editor does not contend for an authority *above* that of his colleagues in Council, *all* have the same access to the papers laid before the Society and the voice of one member of the Council has no more weight than that of another.

But for greater convenience the Council have, under Rule 77, appointed a Sub-Committee of papers to assist and advise with the Secretaries in their duty of editing the Journal. This Sub-Committee under Rules 79 and 81, is entirely under control of the Council, whose general power of superintendence under Rule 99 is thus effectually guarded.

The Librarian submitted his monthly report.

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## LIBRARY.

The following are the accessions to the Library since the meeting held in February last.

*Presented.*

Annals of Indian Administration Vol. VI. Part 4.—BY THE BENGAL GOVERNMENT.

Bijdragen tot de Taal-Land-en Volkenkunde, Zesde Deel, Nos. 1 and 2.—BY THE BATAVIAN ACADEMY.

The Calcutta Christian Observer for Feb. and March.—BY THE EDITOR.

The Principles of Historical Evidence being a Lecture delivered at a meeting of the Bethune Society by Mr. E. B. Cowell.—BY THE AUTHOR.

Essai Statistique Generale de la Belgique.—BY THE REV. J. LONG.

Foulke's Elements of the Saiva Philosophy translated from the Tamil.—BY THE TRANSLATOR.

Garcin de Tassy's Mantic Uttair ou Le Langage des Oiseaux—Traduit du Persan De Farid Uddin Attar.—BY THE TRANSLATOR.

The General Report on Public Instruction in the Lower Provinces of the Bengal Presidency for 1861-62 with appendixes.—BY THE DIRECTOR OF PUBLIC INSTRUCTION.

Educational Map of Bengal 1861-62 with Index.—BY THE SAME.

Heera or the Hindoo Widow, a didactic poem by P. C. L. M. Duplessis.—BY THE AUTHOR.

Journal of the Statistical Society of London, Vol. XXV. Part 4, for December 1862.—BY THE SOCIETY.

Journal of the Bombay Branch of the Royal Asiatic Society, Vol. I. Nos. 1 to 3, and Vol. II. No. 10.—BY THE BOMBAY SOCIETY.

Journal Asiatique, Vol. XX. No. 78.—BY THE PARIS SOCIETY.

The Journal of the Chemical Society, Vol. XV. Nos. 10 to 12.—BY THE SOCIETY.

Journal of Sacred Literature and Biblical record No. 4, New Series.—BY THE EDITORS.

Kavyanirnaya or a treatise on Rhetorical composition in Bengali by Lal Mohun Bhattacharjea.—BY MR. E. B. COWELL.

Muir's Sanskrit Texts, Part I.—BY THE DIRECTOR OF PUBLIC INSTRUCTION.

Mineralogical notes and the fall of Indian aërolites, by Professor N. S. Maskelyne and Dr. Viktor Von Lang of the British Museum.—BY MR. N. S. MASKELYNE.

Map of Central Asia compiled by Major J. T. Walker.—BY THE SURVEYOR GENERAL OF INDIA.

Map of the countries of the Mahsood Wuzeries.—BY THE SAME.

Memoires de la Société Impériale des Sciences Naturelles de Cherbourg Vol. VIII.—BY THE SOCIETY.

The Oriental Baptist Vol. XVI. Nos. 191, 192, and Vol. XVII. Nos. 193 and 194.—BY THE EDITOR.

The Oriental Christian Spectator for December 1862.—BY THE EDITOR.

Report of the British Indian Association for December 1862 and January 1863.—BY THE ASSOCIATION.

Report on the Land Revenue Administration of the Lower Provinces for 1861-62.—BY THE BENGAL GOVERNMENT.

The Twenty-Second Report of the Proceedings of the Calcutta School Book Society, with an appendix.—BY BABU RAJENDRA LAL MITRA.

Vyākaraṇa Pravesh ब्राह्मण प्रवेश, by Babu Rajendra Lal Mitra.—BY THE AUTHOR.

Report on the Trade and resources of the countries on the North Western boundary of British India, with maps and a minute on the same by Sir Robert Montgomery.—BY THE PANJAB GOVERNMENT.

General Report on the Revenue Survey Operations of the Bengal Presidency for 1858 and 1861.—BY THE GOVERNMENT OF INDIA.

First Annual Report of the Acclimatisation Society of Victoria.—BY MR. A. GROTE.

Selections from the Records of the Government of India, Public Works Department, Nos. 35, 36 and 37.—BY THE GOVERNMENT OF INDIA.

A letter to T. Bazley, Esq. M. P. on the Cotton question by Major C. L. Showers, *Pamphlet*.—BY THE AUTHOR.

Diwán Saib.—BY COL. C. S. GUTHRIE.

Diwán Hyder.—BY THE SAME.

Rookáyeat 'Alangiri.—BY THE SAME.

Kashful Mahjúb.—BY THE SAME.

*Exchanged.*

The Athenæum for December, 1862.

The Calcutta Review for January, 1863.

The London and Edinburgh Philosophical Magazine and Journal, Vol. XXIV. Nos. 164 and 165.

*Purchased.*

The Annals and Magazine of Natural History, Vol. XI. No. 61.

The American Journal of Sciences and Arts for November, 1862.

Annuaire des Deux Mondes Histoire Generale des Divers Etats, Vol. XI. for 1861.

Annals des Sciences Naturelles, Zoologic, Vol. XVIII. Nos. 5 and 6.

Bleeker's Atlas Ichthyologique, Part 6.

Bopadeva's Mugdha Bodha Vyākaraṇa with a commentary, 2 copies.

Comptes Rendus, Vol. LV. Nos. 21 to 26, and Vol. LVI. No. 1.

The Edinburgh Review for January, 1863.

The Discoveries of the world by Antonio Galvano, Edited by Vice-Admiral Bethune, C. B.

Hewitson's Exotic Butterflies, Part 45.

The Natural History Review for January, 1863.

Nöldeke's Hebraische Sprache, *Pamphlet*.

Nidána Parisishta নিদান পরিশিষ্ট by Hárádhana Kabiráj, 2 copies.

The Parthenon, Vol. I. Nos. 34 to 37.

The Quarterly Review for January, 1863.

Scheref Námech, Vol. I.

Revue et Magasin de Zoologie, No. 11 of 1862.

Dr. Weber's Indische Studien, Vol. VII. Parts 1 and 2.

The Westminster Review for January, 1863.

Revue des Deux Mondes for 1st January, 1863.

LALGOPAL DUTT.



*Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11 Feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

| Date. | Mean Height of the Barometer at 32° Fahr. | Range of the Barometer during the day. |         |         | Mean Dry Bulb Thermometer. | Range of the Temperature during the day. |      |       |
|-------|-------------------------------------------|----------------------------------------|---------|---------|----------------------------|------------------------------------------|------|-------|
|       |                                           | Max.                                   | Min.    | Diff.   |                            | Max.                                     | Min. | Diff. |
|       | Inches.                                   | Inches.                                | Inches. | Inches. | o                          | o                                        | o    | o     |
| 1     | <i>Sunday.</i>                            |                                        |         |         |                            |                                          |      |       |
| 2     | .994                                      | 30.082                                 | 29.935  | 0.147   | 69.7                       | 81.2                                     | 60.0 | 21.2  |
| 3     | .900                                      | 29.987                                 | .826    | .161    | 71.0                       | 81.4                                     | 62.8 | 18.6  |
| 4     | .867                                      | .944                                   | .812    | .132    | 71.1                       | 81.4                                     | 62.6 | 18.8  |
| 5     | .887                                      | .962                                   | .836    | .126    | 71.2                       | 81.0                                     | 62.8 | 18.2  |
| 6     | .916                                      | .984                                   | .855    | .129    | 72.4                       | 81.8                                     | 63.8 | 18.0  |
| 7     | .964                                      | 30.069                                 | .907    | .162    | 73.4                       | 81.8                                     | 66.4 | 15.4  |
| 8     | <i>Sunday.</i>                            |                                        |         |         |                            |                                          |      |       |
| 9     | .920                                      | .001                                   | .877    | .124    | 69.8                       | 79.6                                     | 60.8 | 18.8  |
| 10    | .909                                      | 29.981                                 | .851    | .130    | 70.1                       | 80.2                                     | 60.0 | 20.2  |
| 11    | .965                                      | 30.026                                 | .882    | .144    | 63.7                       | 69.8                                     | 61.2 | 8.6   |
| 12    | .980                                      | .047                                   | .923    | .124    | 68.0                       | 75.2                                     | 62.4 | 12.8  |
| 13    | .961                                      | .050                                   | .895    | .155    | 68.8                       | 77.5                                     | 60.0 | 17.5  |
| 14    | .902                                      | 29.964                                 | .850    | .114    | 67.5                       | 72.8                                     | 63.2 | 9.6   |
| 15    | <i>Sunday.</i>                            |                                        |         |         |                            |                                          |      |       |
| 16    | .872                                      | .944                                   | .822    | .122    | 72.4                       | 78.6                                     | 68.4 | 10.2  |
| 17    | .919                                      | .991                                   | .867    | .124    | 72.2                       | 81.2                                     | 65.9 | 15.3  |
| 18    | .971                                      | 30.044                                 | .924    | .120    | 72.9                       | 82.8                                     | 63.8 | 19.0  |
| 19    | .994                                      | .073                                   | .935    | .138    | 73.5                       | 83.8                                     | 64.0 | 19.8  |
| 20    | 30.009                                    | .093                                   | .955    | .138    | 74.3                       | 83.9                                     | 66.2 | 17.7  |
| 21    | 29.988                                    | .070                                   | .927    | .143    | 73.9                       | 82.6                                     | 67.0 | 15.6  |
| 22    | <i>Sunday.</i>                            |                                        |         |         |                            |                                          |      |       |
| 23    | .964                                      | .051                                   | .899    | .152    | 70.1                       | 82.4                                     | 59.4 | 23.0  |
| 24    | .985                                      | .097                                   | .928    | .169    | 71.7                       | 83.0                                     | 61.6 | 21.4  |
| 25    | .961                                      | .036                                   | .898    | .138    | 72.1                       | 84.6                                     | 61.1 | 23.5  |
| 26    | .924                                      | 29.995                                 | .861    | .134    | 74.6                       | 85.6                                     | 65.2 | 20.4  |
| 27    | .913                                      | .989                                   | .829    | .160    | 75.4                       | 86.8                                     | 65.8 | 21.0  |
| 28    | .903                                      | .995                                   | .841    | .154    | 77.3                       | 87.8                                     | 67.0 | 20.8  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humi-<br>dity, complete satura-<br>tion being unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------|
|       | o                               | o                   | o                   | o                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                     |
| 1     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 2     | 63.0                            | 6.7                 | 57.6                | 12.1                         | 0.483                            | 5.31                                             | 2.62                                                                    | 0.67                                                                |
| 3     | 65.4                            | 5.6                 | 60.9                | 10.1                         | .539                             | .92                                              | .33                                                                     | .72                                                                 |
| 4     | 63.0                            | 8.1                 | 56.5                | 14.6                         | .465                             | .10                                              | 3.18                                                                    | .62                                                                 |
| 5     | 62.8                            | 8.4                 | 56.1                | 15.1                         | .459                             | .04                                              | .26                                                                     | .61                                                                 |
| 6     | 63.9                            | 8.5                 | 57.1                | 15.3                         | .475                             | .20                                              | .40                                                                     | .61                                                                 |
| 7     | 66.6                            | 6.8                 | 61.2                | 12.2                         | .544                             | .95                                              | 2.92                                                                    | .67                                                                 |
| 8     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 9     | 61.0                            | 8.8                 | 54.0                | 15.8                         | .428                             | 4.70                                             | 3.25                                                                    | .59                                                                 |
| 10    | 62.4                            | 7.7                 | 56.2                | 13.9                         | .461                             | 5.06                                             | 2.97                                                                    | .63                                                                 |
| 11    | 60.8                            | 2.9                 | 58.2                | 5.5                          | .493                             | .48                                              | 1.11                                                                    | .83                                                                 |
| 12    | 63.5                            | 4.5                 | 59.9                | 8.1                          | .521                             | .76                                              | .77                                                                     | .77                                                                 |
| 13    | 63.0                            | 5.8                 | 58.4                | 10.4                         | .496                             | .47                                              | 2.24                                                                    | .71                                                                 |
| 14    | 63.9                            | 3.6                 | 61.0                | 6.5                          | .541                             | .98                                              | 1.44                                                                    | .81                                                                 |
| 15    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 16    | 67.9                            | 4.5                 | 64.3                | 8.1                          | .603                             | 6.61                                             | .99                                                                     | .77                                                                 |
| 17    | 66.1                            | 6.1                 | 61.2                | 11.0                         | .544                             | 5.97                                             | 2.58                                                                    | .70                                                                 |
| 18    | 64.1                            | 8.8                 | 57.1                | 15.8                         | .475                             | .19                                              | 3.54                                                                    | .60                                                                 |
| 19    | 65.9                            | 7.6                 | 60.6                | 12.9                         | .534                             | .82                                              | .08                                                                     | .65                                                                 |
| 20    | 65.9                            | 8.4                 | 60.0                | 14.3                         | .523                             | .71                                              | .41                                                                     | .63                                                                 |
| 21    | 64.9                            | 9.0                 | 58.6                | 15.3                         | .499                             | .45                                              | .56                                                                     | .61                                                                 |
| 22    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                     |
| 23    | 60.2                            | 9.9                 | 52.3                | 17.8                         | .404                             | 4.44                                             | .59                                                                     | .55                                                                 |
| 24    | 60.9                            | 10.8                | 52.3                | 19.4                         | .404                             | .43                                              | 4.00                                                                    | .53                                                                 |
| 25    | 62.3                            | 9.8                 | 54.5                | 17.6                         | .435                             | .76                                              | 3.77                                                                    | .56                                                                 |
| 26    | 64.9                            | 9.7                 | 58.1                | 16.5                         | .491                             | 5.34                                             | .86                                                                     | .58                                                                 |
| 27    | 66.2                            | 9.2                 | 59.8                | 15.6                         | .520                             | .64                                              | .79                                                                     | .60                                                                 |
| 28    | 67.6                            | 9.7                 | 60.8                | 16.5                         | .537                             | .82                                              | 4.16                                                                    | .58                                                                 |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January 1863, the Greenwich New Factors have been used for  
computing Dew-point.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 29.944                                          | 30.010                                                       | 29.863  | 0.147   | 67.5                          | 71.8                                                           | 62.4 | 9.4   |
| 1              | .933                                            | .001                                                         | .853    | .148    | 66.7                          | 70.8                                                           | 62.8 | 8.0   |
| 2              | .923                                            | 29.992                                                       | .841    | .151    | 66.1                          | 69.8                                                           | 61.2 | 8.6   |
| 3              | .914                                            | .981                                                         | .835    | .146    | 65.2                          | 69.4                                                           | 60.8 | 8.6   |
| 4              | .907                                            | .974                                                         | .822    | .152    | 64.5                          | 69.2                                                           | 60.2 | 9.0   |
| 5              | .929                                            | 30.007                                                       | .846    | .161    | 63.8                          | 67.6                                                           | 60.0 | 7.6   |
| 6              | .941                                            | .044                                                         | .856    | .188    | 63.7                          | 68.8                                                           | 59.4 | 9.4   |
| 7              | .961                                            | .052                                                         | .874    | .178    | 63.6                          | 68.4                                                           | 59.6 | 8.8   |
| 8              | .984                                            | .060                                                         | .908    | .152    | 66.5                          | 71.4                                                           | 61.2 | 10.2  |
| 9              | 30.008                                          | .091                                                         | .935    | .156    | 69.6                          | 74.3                                                           | 61.3 | 13.0  |
| 10             | .019                                            | .097                                                         | .943    | .154    | 72.9                          | 77.8                                                           | 62.4 | 15.4  |
| 11             | .007                                            | .081                                                         | .937    | .144    | 75.6                          | 81.6                                                           | 61.9 | 19.7  |
| Noon.          | 29.984                                          | .060                                                         | .917    | .143    | 77.9                          | 84.0                                                           | 62.6 | 21.4  |
| 1              | .953                                            | .037                                                         | .882    | .155    | 79.4                          | 85.8                                                           | 63.8 | 22.0  |
| 2              | .920                                            | .007                                                         | .844    | .163    | 80.4                          | 86.8                                                           | 64.2 | 22.6  |
| 3              | .898                                            | 29.986                                                       | .823    | .163    | 80.7                          | 87.8                                                           | 63.2 | 24.6  |
| 4              | .888                                            | .977                                                         | .812    | .165    | 80.3                          | 86.4                                                           | 63.2 | 23.2  |
| 5              | .888                                            | .962                                                         | .824    | .138    | 79.4                          | 84.9                                                           | 70.6 | 14.3  |
| 6              | .894                                            | .965                                                         | .813    | .152    | 75.8                          | 82.6                                                           | 63.6 | 19.0  |
| 7              | .910                                            | .991                                                         | .837    | .154    | 73.4                          | 79.8                                                           | 63.0 | 16.8  |
| 8              | .927                                            | 30.011                                                       | .851    | .160    | 72.0                          | 79.2                                                           | 63.0 | 16.2  |
| 9              | .941                                            | .028                                                         | .858    | .170    | 70.8                          | 78.6                                                           | 63.4 | 15.2  |
| 10             | .946                                            | .020                                                         | .850    | .170    | 69.7                          | 78.0                                                           | 62.8 | 15.2  |
| 11             | .944                                            | .021                                                         | .855    | .166    | 68.9                          | 77.6                                                           | 62.0 | 15.6  |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.      | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being unity. |
|------------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
|            | o                          | o                   | o                   | o                         | Inches.                       | Troy grs.                                     | Troy grs.                                                     |                                                           |
| Mid-night. | 63.1                       | 4.4                 | 59.6                | 7.9                       | .0516                         | 5.71                                          | 1.71                                                          | 0.77                                                      |
| 1          | 62.7                       | 4.0                 | 59.5                | 7.2                       | .515                          | .70                                           | .53                                                           | .79                                                       |
| 2          | 62.4                       | 3.7                 | 59.4                | 6.7                       | .513                          | .68                                           | .42                                                           | .80                                                       |
| 3          | 61.7                       | 3.5                 | 58.9                | 6.3                       | .504                          | .60                                           | .31                                                           | .81                                                       |
| 4          | 61.0                       | 3.5                 | 58.2                | 6.3                       | .493                          | .48                                           | .28                                                           | .81                                                       |
| 5          | 60.6                       | 3.2                 | 57.7                | 6.1                       | .485                          | .39                                           | .22                                                           | .82                                                       |
| 6          | 60.6                       | 3.1                 | 57.8                | 5.9                       | .486                          | .41                                           | .18                                                           | .82                                                       |
| 7          | 60.4                       | 3.2                 | 57.5                | 6.1                       | .481                          | .36                                           | .21                                                           | .82                                                       |
| 8          | 61.8                       | 4.7                 | 58.0                | 8.5                       | .489                          | .41                                           | .78                                                           | .75                                                       |
| 9          | 63.0                       | 6.6                 | 57.7                | 11.9                      | .485                          | .33                                           | 2.57                                                          | .68                                                       |
| 10         | 64.2                       | 8.7                 | 57.2                | 15.7                      | .476                          | .20                                           | 3.53                                                          | .60                                                       |
| 11         | 64.8                       | 10.8                | 57.2                | 18.4                      | .476                          | .18                                           | 4.30                                                          | .55                                                       |
| Noon.      | 65.2                       | 12.7                | 56.3                | 21.6                      | .462                          | .00                                           | 5.16                                                          | .49                                                       |
| 1          | 65.8                       | 13.6                | 56.3                | 23.1                      | .462                          | 4.99                                          | .63                                                           | .47                                                       |
| 2          | 66.3                       | 14.1                | 56.4                | 24.0                      | .464                          | .99                                           | .95                                                           | .46                                                       |
| 3          | 66.5                       | 14.2                | 56.6                | 24.1                      | .467                          | 5.03                                          | 6.01                                                          | .46                                                       |
| 4          | 66.1                       | 14.2                | 56.2                | 24.1                      | .461                          | 4.96                                          | 5.95                                                          | .46                                                       |
| 5          | 66.7                       | 12.7                | 57.8                | 21.6                      | .486                          | 5.24                                          | .38                                                           | .49                                                       |
| 6          | 67.3                       | 8.5                 | 61.3                | 14.5                      | .546                          | .94                                           | 3.60                                                          | .62                                                       |
| 7          | 66.3                       | 7.1                 | 60.6                | 12.8                      | .534                          | .82                                           | .05                                                           | .66                                                       |
| 8          | 65.7                       | 6.3                 | 60.7                | 11.3                      | .536                          | .87                                           | 2.63                                                          | .69                                                       |
| 9          | 64.9                       | 5.9                 | 60.2                | 10.6                      | .527                          | .78                                           | .42                                                           | .71                                                       |
| 10         | 64.4                       | 5.3                 | 60.2                | 9.5                       | .527                          | .79                                           | .14                                                           | .73                                                       |
| 11         | 63.8                       | 5.1                 | 59.7                | 9.2                       | .518                          | .72                                           | .02                                                           | .74                                                       |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January 1863, the Greenwich New Factors have been used for  
computing Dew-point.

Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                            |
|-------|-----------------------|---------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| 1     | o                     | Inches                          | <i>Sunday.</i>                    |                                                                                                                       |
| 2     | 135.0                 | ...                             | Variable.                         | Cloudless; also foggy between 8 & 9 P. M.                                                                             |
| 3     | 135.0                 | ...                             | S. W. & W.                        | Cloudless.                                                                                                            |
| 4     | 137.0                 | ...                             | W. & S. W.                        | Cloudless; also foggy after 9 P. M.                                                                                   |
| 5     | 140.2                 | ...                             | N. W. & S. W.                     | Cloudless.                                                                                                            |
| 6     | 137.0                 | ...                             | S. W. & S.                        | Cloudless till 7 P. M. Scatd. clouds afterwards; also drizzled between 8 and 9 P. M.                                  |
| 7     | 135.0                 | ...                             | S. W. & S.                        | Scatd. $\vee$ i till 2 P. M. cloudless afterwards; also drizzling between 8 & 9 P. M.                                 |
| 8     | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                       |
| 9     | 138.5                 | ...                             | N. W. & W. & N.                   | Cloudless.                                                                                                            |
| 10    | 133.0                 | ...                             | E. & N. W.                        | Cloudless till 2 P. M. cloudy afterwards; also drizzling at 8 & 10 P. M.                                              |
| 11    | ...                   | 0.96                            | E. & N.                           | Cloudy; also incessantly drizzling the whole day.                                                                     |
| 12    | 134.5                 | ...                             | N. & N. E. & W.                   | Cloudy till 7 A. M. Scatd. $\circ$ i till 4 P. M. cloudless afterwards; also foggy at Midnight                        |
| 13    | 133.0                 | ...                             | N. & N. W.                        | Cloudless till 10 A. M. Scatd. $\vee$ i & $\circ$ i till 3 P. M. cloudless afterwards; also slightly foggy at 9 P. M. |
| 14    | ...                   | ...                             | E. & S. & S. E.                   | Cloudless till 4 A. M. cloudy till 6 P. M. cloudless afterwards.                                                      |
| 15    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                       |
| 16    | 129.0                 | 0.24                            | N. E. & S.                        | Cloudy till 11 A. M. Scatd. $\vee$ i till 6 P. M. cloudy afterwards; also raining at 4 A. M. & between 6 & 7 A. M.    |
| 17    | 134.0                 | ...                             | N. & E.                           | Scatd. clouds till 1 P. M. cloudless afterwards; also foggy between 4 & 7 A. M.                                       |
| 18    | 136.9                 | ...                             | E. & S. E.                        | Cloudless.                                                                                                            |
| 19    | 136.5                 | ...                             | S. & S. E. & E.                   | Cloudless.                                                                                                            |
| 20    | 134.4                 | ...                             | N. & E.                           | Cloudless.                                                                                                            |
| 21    | 134.0                 | ...                             | N.                                | Cloudless.                                                                                                            |
| 22    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                       |
| 23    | 130.0                 | ...                             | W.                                | Cloudless.                                                                                                            |
| 24    | 134.8                 | ...                             | W. & S.                           | Cloudless.                                                                                                            |
| 25    | 140.0                 | ...                             | N. W. & W. & S. W.                | Cloudless.                                                                                                            |
| 26    | 137.8                 | ...                             | W. & S.                           | Cloudless.                                                                                                            |
| 27    | 140.0                 | ...                             | S. W. & W.                        | Cloudless.                                                                                                            |
| 28    | 132.0                 | ...                             | W. & S.                           | Cloudless.                                                                                                            |

$\vee$ i Cirri,  $\vee$ i Cirro strati,  $\circ$ i Cumuli,  $\sim$ i Cumulo strati,  $\vee$ -i Nimbi,—i Strati,  $\vee$  i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

## MONTHLY RESULTS.

|                                                                      | Inches |
|----------------------------------------------------------------------|--------|
| Mean height of the Barometer for the month, .. ..                    | 29.940 |
| Max. height of the Barometer occurred at 10 A. M. on the 24th, .. .. | 30.097 |
| Min. height of the Barometer occurred at 4 P. M. on the 4th, .. ..   | 29.812 |
| <i>Extreme range</i> of the Barometer during the month, .. ..        | 0.285  |
| Mean of the Daily Max. Pressures, . .. ..                            | 30.020 |
| Ditto ditto Min. ditto, .. ..                                        | 29.881 |
| <i>Mean daily range</i> of the Barometer during the month, .. ..     | 0.139  |

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|                                                                    | °    |
|--------------------------------------------------------------------|------|
| Mean Dry Bulb Thermometer for the month, .. ..                     | 71.6 |
| Max. Temperature occurred at 3 P. M. on the 28th, .. ..            | 87.8 |
| Min. Temperature occurred at 6 A. M. on the 23rd, .. ..            | 59.4 |
| <i>Extreme range</i> of the Temperature during the month, .. ..    | 28.4 |
| Mean of the daily Max. Temperature, .. ..                          | 81.1 |
| Ditto ditto Min. ditto, .. ..                                      | 63.4 |
| <i>Mean daily range</i> of the Temperature during the month, .. .. | 17.7 |
| Mean Wet Bulb Thermometer for the month, .. ..                     | 64.0 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, .. ..   | 7.6  |
| Computed Mean Dew-point for the month, .. ..                       | 57.9 |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, .. ..     | 13.7 |

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|                                                   | Inches |
|---------------------------------------------------|--------|
| Mean Elastic force of Vapour for the month, .. .. | 0.488  |

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|                                                                               | Troy grains |
|-------------------------------------------------------------------------------|-------------|
| Mean Weight of Vapour for the month, .. ..                                    | 5.34        |
| Additional Weight of Vapour required for complete saturation, .. ..           | 3.06        |
| Mean degree of humidity for the month, complete saturation being unity, .. .. | 0.64        |

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|                                                         | Inches       |
|---------------------------------------------------------|--------------|
| Rained 5 days, Max. fall of rain during 24 hours, .. .. | 0.96         |
| Total amount of rain during the month, .. ..            | 1.20         |
| Prevailing direction of the Wind, .. ..                 | W. & N. & E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of February, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

| Hour.     | No. of days. |                   |          |    |                   |          |    |                   |          |    |          |       |                   |          | Missed. |
|-----------|--------------|-------------------|----------|----|-------------------|----------|----|-------------------|----------|----|----------|-------|-------------------|----------|---------|
|           | N.           | Rain on.<br>N. E. | Rain on. | E. | Rain on.<br>S. E. | Rain on. | S. | Rain on.<br>S. W. | Rain on. | W. | Rain on. | N. W. | Rain on.<br>Calm. | Rain on. |         |
| Midnight. | 4            |                   |          | 5  | 1                 |          |    | 4                 | 1        | 6  | 2        |       |                   |          | 2       |
| 1         | 4            |                   |          | 4  | 1                 |          |    | 4                 | 4        | 6  | 2        |       |                   |          |         |
| 2         | 4            |                   |          | 4  | 1                 |          |    | 4                 | 4        | 5  | 2        |       |                   |          | 1       |
| 3         | 4            |                   |          | 4  | 1                 |          |    | 4                 | 4        | 5  | 3        |       |                   |          |         |
| 4         | 3            |                   |          | 4  | 1                 |          |    | 4                 | 1        | 4  | 3        |       |                   |          | 4       |
| 5         | 5            |                   |          | 2  |                   |          |    | 2                 | 2        | 6  | 3        |       |                   |          | 4       |
| 6         | 5            | 2                 | 1        | 3  |                   | 1        |    | 3                 | 3        | 5  | 3        |       |                   |          |         |
| 7         | 6            | 2                 |          | 2  |                   | 1        | 1  | 3                 | 3        | 3  | 4        |       |                   |          |         |
| 8         | 2            | 2                 |          | 3  | 1                 |          |    | 2                 | 2        | 6  | 3        |       |                   |          | 3       |
| 9         | 3            | 3                 |          | 5  | 1                 | 1        |    | 1                 | 3        | 6  | 2        |       |                   |          |         |
| 10        | 4            | 5                 |          | 2  |                   | 3        |    | 1                 |          | 4  | 5        |       |                   |          |         |
| 11        | 2            | 4                 |          | 4  | 1                 | 2        |    | 1                 | 1        | 6  | 4        |       |                   |          |         |
| Noon.     | 2            | 4                 |          | 3  | 1                 | 2        |    | 1                 | 1        | 6  | 4        |       |                   |          |         |
| 1         | 4            | 1                 |          | 4  | 1                 | 1        |    | 2                 | 2        | 3  | 7        | 1     |                   |          |         |
| 2         | 4            | 3                 |          | 3  | 1                 | 2        |    | 1                 | 4        | 4  | 3        |       |                   |          |         |
| 3         | 3            | 1                 |          | 2  | 1                 | 3        |    | 2                 | 3        | 6  | 4        |       |                   |          |         |
| 4         | 3            | 1                 |          | 4  | 1                 | 3        |    | 2                 | 2        | 5  | 5        |       |                   |          | 1       |
| 5         | 2            | 2                 |          | 5  |                   | 1        |    | 1                 | 5        | 5  | 2        |       |                   |          | 1       |
| 6         | 4            | 1                 |          | 4  |                   | 2        |    | 1                 | 5        | 5  | 2        |       |                   |          |         |
| 7         | 4            | 1                 |          | 3  |                   | 2        |    | 3                 | 3        | 5  | 4        |       |                   |          |         |
| 8         | 4            | 1                 |          | 3  | 1                 | 2        |    | 3                 | 3        | 5  | 2        |       |                   |          |         |
| 9         | 4            | 1                 |          | 3  |                   | 2        |    | 3                 | 1        | 6  | 4        |       |                   |          |         |
| 10        | 4            | 1                 |          | 3  | 1                 | 2        |    | 4                 | 5        | 4  | 1        |       |                   |          |         |
| 11        | 4            | 1                 |          | 3  |                   | 2        |    | 4                 | 5        | 4  | 1        |       |                   |          |         |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 2     | 29.800                                          | 29.885                                    | 29.726  | 0.159   | 79.7                          | 89.6                                          | 71.6 | 18.0  |
| 3     | .762                                            | .832                                      | .700    | .132    | 80.9                          | 91.1                                          | 73.8 | 17.3  |
| 4     | .795                                            | .876                                      | .746    | .130    | 81.3                          | 91.3                                          | 74.8 | 16.5  |
| 5     | .814                                            | .923                                      | .791    | .132    | 81.4                          | 91.4                                          | 75.8 | 15.6  |
| 6     | .832                                            | .909                                      | .774    | .135    | 81.6                          | 91.6                                          | 75.0 | 16.6  |
| 7     | .831                                            | .903                                      | .782    | .121    | 81.0                          | 91.8                                          | 74.8 | 17.0  |
| 8     | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 9     | .876                                            | .947                                      | .823    | .124    | 80.8                          | 91.8                                          | 72.0 | 19.8  |
| 10    | .866                                            | .954                                      | .794    | .160    | 81.4                          | 91.8                                          | 74.0 | 17.8  |
| 11    | .793                                            | .882                                      | .722    | .160    | 81.5                          | 91.3                                          | 73.8 | 17.5  |
| 12    | .754                                            | .831                                      | .702    | .129    | 81.6                          | 94.0                                          | 71.8 | 22.2  |
| 13    | .739                                            | .811                                      | .683    | .128    | 81.7                          | 93.0                                          | 75.0 | 18.0  |
| 14    | .814                                            | .889                                      | .751    | .138    | 81.9                          | 90.6                                          | 76.2 | 14.4  |
| 15    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 16    | .872                                            | .955                                      | .818    | .137    | 80.7                          | 87.2                                          | 75.8 | 11.4  |
| 17    | .823                                            | .898                                      | .759    | .139    | 80.7                          | 92.4                                          | 72.8 | 19.6  |
| 18    | .865                                            | .937                                      | .809    | .128    | 79.3                          | 87.6                                          | 71.2 | 16.4  |
| 19    | .917                                            | 30.017                                    | .847    | .170    | 81.9                          | 92.2                                          | 73.4 | 18.8  |
| 20    | .896                                            | 29.976                                    | .828    | .148    | 83.0                          | 93.4                                          | 74.2 | 19.2  |
| 21    | .896                                            | .975                                      | .837    | .138    | 83.5                          | 93.4                                          | 74.0 | 19.4  |
| 22    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 23    | .863                                            | .918                                      | .801    | .147    | 86.8                          | 96.0                                          | 77.8 | 18.2  |
| 24    | .846                                            | .930                                      | .791    | .139    | 86.3                          | 97.8                                          | 76.8 | 21.0  |
| 25    | .839                                            | .906                                      | .788    | .118    | 87.6                          | 98.4                                          | 77.0 | 21.4  |
| 26    | .845                                            | .921                                      | .775    | .146    | 85.6                          | 96.4                                          | 75.4 | 21.0  |
| 27    | .803                                            | .887                                      | .731    | .156    | 85.7                          | 96.9                                          | 76.4 | 20.5  |
| 28    | .769                                            | .854                                      | .696    | .158    | 85.8                          | 97.6                                          | 75.6 | 22.0  |
| 29    | <i>Sunday.</i>                                  |                                           |         |         |                               |                                               |      |       |
| 30    | .771                                            | .848                                      | .697    | .151    | 86.4                          | 98.0                                          | 80.0 | 18.0  |
| 31    | .761                                            | .848                                      | .676    | .172    | 87.0                          | 99.0                                          | 79.8 | 19.2  |

The Mean height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the twenty-four hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a Cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being unity. |
|-------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
|       | o                          | o                   | o                   | o                         | Inches.                       | T. gr.                                        | T. gr.                                                        |                                                           |
| 1     | <i>Sunday.</i>             |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 2     | 71.4                       | 8.3                 | 65.6                | 14.1                      | 0.630                         | 6.80                                          | 3.92                                                          | 0.63                                                      |
| 3     | 73.9                       | 7.0                 | 69.0                | 11.9                      | .704                          | 7.57                                          | .53                                                           | .68                                                       |
| 4     | 74.7                       | 6.6                 | 70.1                | 11.2                      | .729                          | .85                                           | .39                                                           | .70                                                       |
| 5     | 74.2                       | 7.2                 | 69.2                | 12.2                      | .708                          | .62                                           | .65                                                           | .68                                                       |
| 6     | 74.4                       | 7.2                 | 69.4                | 12.2                      | .713                          | .67                                           | .67                                                           | .68                                                       |
| 7     | 71.2                       | 9.8                 | 64.3                | 16.7                      | .603                          | 6.49                                          | 4.65                                                          | .58                                                       |
| 8     | <i>Sunday.</i>             |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 9     | 73.5                       | 7.3                 | 68.4                | 12.4                      | .690                          | 7.44                                          | 3.63                                                          | .67                                                       |
| 10    | 74.6                       | 6.8                 | 69.8                | 11.6                      | .722                          | .76                                           | .51                                                           | .69                                                       |
| 11    | 75.6                       | 5.9                 | 71.5                | 10.0                      | .763                          | 8.21                                          | .10                                                           | .73                                                       |
| 12    | 70.8                       | 10.8                | 63.2                | 18.4                      | .582                          | 6.26                                          | 5.08                                                          | .55                                                       |
| 13    | 75.6                       | 6.1                 | 71.3                | 10.4                      | .758                          | 8.16                                          | 3.21                                                          | .72                                                       |
| 14    | 73.4                       | 8.5                 | 67.4                | 14.5                      | .668                          | 7.17                                          | 4.27                                                          | .63                                                       |
| 15    | <i>Sunday.</i>             |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 16    | 73.2                       | 7.5                 | 67.9                | 12.8                      | .679                          | .31                                           | 3.73                                                          | .66                                                       |
| 17    | 71.2                       | 9.5                 | 64.5                | 16.2                      | .607                          | 6.54                                          | 4.50                                                          | .59                                                       |
| 18    | 68.9                       | 10.4                | 61.6                | 17.7                      | .552                          | 5.95                                          | .64                                                           | .56                                                       |
| 19    | 69.7                       | 12.2                | 61.2                | 20.7                      | .544                          | .84                                           | 5.60                                                          | .51                                                       |
| 20    | 74.0                       | 9.0                 | 67.7                | 15.3                      | .674                          | 7.24                                          | 4.58                                                          | .61                                                       |
| 21    | 69.7                       | 13.8                | 60.0                | 23.5                      | .523                          | 5.59                                          | 6.41                                                          | .47                                                       |
| 22    | <i>Sunday.</i>             |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 23    | 72.1                       | 14.7                | 63.3                | 23.5                      | .584                          | 6.20                                          | 7.01                                                          | .47                                                       |
| 24    | 72.8                       | 13.5                | 63.3                | 23.0                      | .584                          | .21                                           | 6.81                                                          | .48                                                       |
| 25    | 72.1                       | 15.5                | 62.8                | 24.8                      | .574                          | .10                                           | 7.42                                                          | .45                                                       |
| 26    | 70.2                       | 15.4                | 59.4                | 26.2                      | .513                          | 5.47                                          | .29                                                           | .43                                                       |
| 27    | 72.5                       | 13.1                | 63.4                | 22.3                      | .586                          | 6.24                                          | 6.56                                                          | .49                                                       |
| 28    | 72.5                       | 13.3                | 63.2                | 22.6                      | .582                          | .19                                           | .64                                                           | .48                                                       |
| 29    | <i>Sunday.</i>             |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 30    | 79.7                       | 6.7                 | 75.0                | 11.4                      | .854                          | 9.11                                          | 3.95                                                          | .70                                                       |
| 31    | 79.5                       | 7.5                 | 75.0                | 12.0                      | .854                          | .09                                           | 4.20                                                          | .68                                                       |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January 1863, the Greenwich New Factors have been used  
for computing Dew-point.



*Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

| Hour.      | Mean Height of the Barometer at 32° Fahr. | Range of the Barometer for each hour during the month. |         |         | Mean Dry Bulb Thermometer. | Range of the Temperature for each hour during the month. |      |       |
|------------|-------------------------------------------|--------------------------------------------------------|---------|---------|----------------------------|----------------------------------------------------------|------|-------|
|            |                                           | Max.                                                   | Min.    | Diff.   |                            | Max.                                                     | Min. | Diff. |
|            | Inches.                                   | Inches.                                                | Inches. | Inches. | o                          | o                                                        | o    | o     |
| Mid-night. | 29.833                                    | 29.906                                                 | 29.731  | 0.175   | 78.1                       | 81.8                                                     | 75.0 | 6.8   |
| 1          | .823                                      | .897                                                   | .718    | .179    | 77.4                       | 81.4                                                     | 73.6 | 7.8   |
| 2          | .813                                      | .888                                                   | .716    | .172    | 76.7                       | 81.0                                                     | 73.4 | 7.6   |
| 3          | .800                                      | .881                                                   | .703    | .178    | 76.3                       | 80.8                                                     | 73.2 | 7.6   |
| 4          | .797                                      | .877                                                   | .705    | .172    | 76.0                       | 80.4                                                     | 72.4 | 8.0   |
| 5          | .805                                      | .891                                                   | .716    | .175    | 75.4                       | 80.0                                                     | 71.2 | 8.8   |
| 6          | .832                                      | .918                                                   | .732    | .186    | 75.1                       | 80.0                                                     | 71.2 | 8.8   |
| 7          | .851                                      | .957                                                   | .746    | .211    | 75.4                       | 80.2                                                     | 71.6 | 8.6   |
| 8          | .882                                      | .992                                                   | .787    | .205    | 78.5                       | 82.8                                                     | 75.2 | 7.6   |
| 9          | .898                                      | 30.004                                                 | .797    | .207    | 81.5                       | 87.8                                                     | 75.8 | 12.0  |
| 10         | .903                                      | .014                                                   | .811    | .203    | 84.6                       | 90.2                                                     | 80.6 | 9.6   |
| 11         | .892                                      | .017                                                   | .798    | .219    | 87.4                       | 92.2                                                     | 83.8 | 8.4   |
| Noon.      | .867                                      | 29.992                                                 | .772    | .220    | 89.8                       | 95.0                                                     | 85.0 | 10.0  |
| 1          | .836                                      | .953                                                   | .742    | .211    | 91.5                       | 97.0                                                     | 86.2 | 10.8  |
| 2          | .807                                      | .925                                                   | .701    | .224    | 92.7                       | 98.6                                                     | 87.2 | 11.4  |
| 3          | .783                                      | .885                                                   | .687    | .198    | 93.1                       | 99.0                                                     | 86.6 | 12.4  |
| 4          | .771                                      | .874                                                   | .681    | .193    | 92.7                       | 98.8                                                     | 85.5 | 13.3  |
| 5          | .771                                      | .858                                                   | .688    | .170    | 89.9                       | 96.4                                                     | 83.8 | 12.6  |
| 6          | .772                                      | .853                                                   | .676    | .177    | 87.1                       | 94.2                                                     | 81.9 | 12.3  |
| 7          | .785                                      | .859                                                   | .698    | .161    | 84.5                       | 89.4                                                     | 80.8 | 8.6   |
| 8          | .806                                      | .881                                                   | .724    | .157    | 82.5                       | 86.8                                                     | 78.6 | 8.2   |
| 9          | .823                                      | .898                                                   | .754    | .144    | 81.0                       | 86.8                                                     | 77.6 | 9.2   |
| 10         | .830                                      | .913                                                   | .748    | .165    | 79.9                       | 86.6                                                     | 76.4 | 10.2  |
| 11         | .831                                      | .915                                                   | .740    | .175    | 78.9                       | 84.0                                                     | 75.0 | 9.0   |

The Mean Height of the Barometer, as likewise the Mean Dry and Wet Bulb Thermometers are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force<br>of Vapour. | Mean Weight of Va-<br>pour in a Cubic<br>foot of air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                                |                                                                      |
| Mid-<br>night. | 72.7                            | 5.4                 | 68.9                | 9.2                          | .6701                            | 7.60                                                  | 2.62                                                                     | 0.74                                                                 |
| 1              | 72.4                            | 5.0                 | 68.9                | 8.5                          | .701                             | .60                                                   | .41                                                                      | .76                                                                  |
| 2              | 71.8                            | 4.9                 | 68.4                | 8.3                          | .690                             | .50                                                   | .30                                                                      | .77                                                                  |
| 3              | 72.0                            | 4.3                 | 69.0                | 7.3                          | .704                             | .65                                                   | .04                                                                      | .79                                                                  |
| 4              | 71.8                            | 4.2                 | 68.9                | 7.1                          | .701                             | .63                                                   | 1.97                                                                     | .80                                                                  |
| 5              | 71.7                            | 3.7                 | 69.1                | 6.3                          | .706                             | .69                                                   | .74                                                                      | .82                                                                  |
| 6              | 71.0                            | 4.1                 | 68.1                | 7.0                          | .684                             | .44                                                   | .90                                                                      | .80                                                                  |
| 7              | 71.1                            | 4.3                 | 68.1                | 7.3                          | .684                             | .44                                                   | .99                                                                      | .79                                                                  |
| 8              | 72.0                            | 6.5                 | 67.4                | 11.1                         | .668                             | .23                                                   | 3.12                                                                     | .70                                                                  |
| 9              | 72.4                            | 9.1                 | 66.0                | 15.5                         | .638                             | 6.85                                                  | 4.46                                                                     | .61                                                                  |
| 10             | 73.2                            | 11.4                | 65.2                | 19.4                         | .621                             | .65                                                   | 5.74                                                                     | .54                                                                  |
| 11             | 73.4                            | 14.0                | 65.0                | 22.4                         | .617                             | .57                                                   | 6.88                                                                     | .49                                                                  |
| Noon.          | 74.1                            | 15.7                | 64.7                | 25.1                         | .611                             | .47                                                   | 7.95                                                                     | .45                                                                  |
| 1              | 74.3                            | 17.2                | 64.0                | 27.5                         | .597                             | .28                                                   | 8.87                                                                     | .42                                                                  |
| 2              | 74.7                            | 18.0                | 63.9                | 28.8                         | .595                             | .25                                                   | 9.43                                                                     | .40                                                                  |
| 3              | 74.3                            | 18.8                | 63.0                | 30.1                         | .578                             | .08                                                   | .78                                                                      | .38                                                                  |
| 4              | 74.7                            | 18.0                | 63.9                | 28.8                         | .595                             | .25                                                   | .43                                                                      | .40                                                                  |
| 5              | 74.6                            | 15.3                | 65.4                | 24.5                         | .626                             | .61                                                   | 7.85                                                                     | .46                                                                  |
| 6              | 74.9                            | 12.2                | 67.6                | 19.5                         | .672                             | 7.11                                                  | 6.19                                                                     | .54                                                                  |
| 7              | 74.2                            | 10.3                | 67.0                | 17.5                         | .659                             | .04                                                   | 5.31                                                                     | .57                                                                  |
| 8              | 73.8                            | 8.7                 | 67.7                | 14.8                         | .674                             | .24                                                   | 4.40                                                                     | .62                                                                  |
| 9              | 73.5                            | 7.5                 | 68.2                | 12.8                         | .686                             | .38                                                   | 3.76                                                                     | .66                                                                  |
| 10             | 73.1                            | 6.8                 | 68.3                | 11.6                         | .688                             | .42                                                   | .36                                                                      | .69                                                                  |
| 11             | 73.0                            | 5.9                 | 68.9                | 10.0                         | .701                             | .59                                                   | 2.88                                                                     | .73                                                                  |

All the Hygrometrical elements are computed by the Greenwich Constants.

From the 1st January 1863, the Greenwich New Factors have been used for computing Dew-point.

Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                             |
|-------|-----------------------|---------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------|
|       | o                     | Inches                          |                                   |                                                                                                        |
| 1     | ...                   | ...                             | Sunday.                           |                                                                                                        |
| 2     | 140.8                 | ...                             | S. & S. W.                        | Cloudless.                                                                                             |
| 3     | 138.5                 | ...                             | S.                                | Cloudless till 2 A. M. cloudy till 8 A. M. cloudless afterwards.                                       |
| 4     | 139.0                 | ...                             | S.                                | Cloudless till 6 A. M. Scatd. clouds till 10 A. M. cloudless afterwards.                               |
| 5     | 139.1                 | ...                             | S.                                | Cloudy till 8 A. M. cloudless afterwards.                                                              |
| 6     | 137.0                 | ...                             | S. & S. W.                        | Flying clouds till 7 A. M. cloudless afterwards.                                                       |
| 7     | 142.5                 | ...                             | S. & S. W.                        | Cloudless.                                                                                             |
| 8     | ...                   | ...                             | Sunday.                           |                                                                                                        |
| 9     | 140.0                 | ...                             | S. W. & S.                        | Cloudless.                                                                                             |
| 10    | 137.5                 | ...                             | S.                                | Cloudless till 4 A. M. cloudy till 9 A. M. cloudless afterwards; also foggy between Midnight & 4 A. M. |
| 11    | 137.4                 | ...                             | S.                                | Flying clouds till 4 A. M. cloudless afterwards; also foggy between 5 & 7 A. M.                        |
| 12    | 138.0                 | ...                             | S.                                | Cloudless.                                                                                             |
| 13    | 140.0                 | ...                             | S.                                | Cloudless till 1 P. M. Scatd. ~i till 6 P. M. cloudless afterwards.                                    |
| 14    | 135.3                 | ...                             | S. W. & S.                        | Cloudless.                                                                                             |
| 15    | ...                   | ...                             | Sunday.                           |                                                                                                        |
| 16    | ...                   | ...                             | S. & W. & S. W.                   | Cloudy till 6 P. M. cloudless afterwards.                                                              |
| 17    | 137.5                 | ...                             | S. & W. & N. W.                   | Cloudless till 4 A. M. cloudy till 9 A. M. Scatd. ~i till 7 P. M. cloudless afterwards.                |
| 18    | ...                   | ...                             | N. W. & S. W.                     | Cloudless till 6 A. M. cloudy till 6 P. M. Scatd. ~i afterwards.                                       |
| 19    | 133.0                 | ...                             | S. & E. & N.                      | Cloudy till 9 A. M. Scatd. ~i till 4 P. M. cloudless afterwards.                                       |
| 20    | 133.5                 | ...                             | W. & S. W. & S.                   | Cloudless till 3 P. M. cloudy afterwards.                                                              |
| 21    | 135.3                 | ...                             | S. & N.                           | Scatd. clouds till 3 A. M. Scatd. ~i till 5 P. M.; Scatd. oi afterwards.                               |
| 22    | ...                   | ...                             | Sunday.                           |                                                                                                        |
| 23    | 137.8                 | ...                             | S. W. & W.                        | Cloudy till 6 A. M. Scatd. ~i till Noon; cloudless afterwards.                                         |
| 24    | 140.4                 | ...                             | S. W. & W.                        | Cloudless.                                                                                             |
| 25    | 137.0                 | ...                             | N. W. & N. & S. W.                | Cloudless.                                                                                             |
| 26    | 136.0                 | ...                             | N. & N. W.                        | Cloudless.                                                                                             |
| 27    | 144.2                 | ...                             | N. & S. W.                        | Cloudless.                                                                                             |

~i Cirri, ~i Cirro strati, oi Cumuli, ~i Cumulo strati, ~i Nimbi, —i Strati  
~i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                              |
|-------|-----------------------|---------------------------------|-----------------------------------|-------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                         |
| 28    | 138.0                 | ...                             | S. & N. & W.                      | Cloudless.                                                              |
| 29    | ..                    | ...                             | <i>Sunday.</i>                    |                                                                         |
| 30    | 139.5                 | ...                             | S.                                | Cloudy till 8 A. M. cloudless afterwards.                               |
| 31    | 140.0                 | ...                             | S.                                | Cloudless till 4 A. M. Scatd. clouds till 9 A. M. cloudless afterwards. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

MONTHLY RESULTS.

|                                                                |    |    | Inches |
|----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                    | .. | .. | 29.826 |
| Max. height of the Barometer occurred at 11 A. M. on the 19th, | .. | .. | 30.017 |
| Min. height of the Barometer occurred at 6 P. M. on the 31st,  | .. | .. | 29.676 |
| <i>Extreme range</i> of the Barometer during the month,        | .. | .. | 0.341  |
| Mean of the daily Max. Pressures,                              | .. | .. | 29.905 |
| Ditto ditto Min. ditto,                                        | .. | .. | 29.763 |
| <i>Mean daily range</i> of the Barometer during the month,     | .. | .. | 0.142  |

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|                                                              |    |    | o    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 82.9 |
| Max. Temperature occurred at 3 P. M. on the 31st,            | .. | .. | 99.0 |
| Min. Temperature occurred at 5 & 6 A. M. on the 18th,        | .. | .. | 71.2 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 27.8 |
| Mean of the daily Max. Temperature,                          | .. | .. | 93.3 |
| Ditto ditto Min. ditto,                                      | .. | .. | 75.0 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 18.3 |

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|                                                            |    |    | o               |
|------------------------------------------------------------|----|----|-----------------|
| Mean Wet Bulb Thermometer for the month,                   | .. | .. | 73.1            |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, | .. | .. | 9.8             |
| Computed Mean Dew-point for the month,                     | .. | .. | 66.2            |
| Mean Dry Bulb Thermometer above computed Mean Dew-point,   | .. | .. | 16.7            |
| Mean Elastic force of Vapour for the month,                | .. | .. | Inches<br>0.642 |

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|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 6.88        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 4.91        |
| Mean degree of humidity for the month, complete saturation being unity, | .. | .. | 0.58        |

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|                                                     |    |    | Inches     |
|-----------------------------------------------------|----|----|------------|
| Rained No. days, Max. fall of rain during 24 hours, | .. | .. | Nil.       |
| Total amount of rain during the month,              | .. | .. | Nil.       |
| Prevailing direction of the Wind,                   | .. | .. | S. & S. W. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of March, 1863.*

## MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.       |              | N. E.    |              | E.       |              | S. E.    |              | S.       |              | S. W.    |              | W.       |              | N. W.    |              | Calm.    |              | Missed.  |              |
|-----------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|----------|--------------|
|           | Rain on. | No. of days. | Rain on. | No. of days. | Rain on. | No. of days. | Rain on. | No. of days. | Rain on. | No. of days. | Rain on. | No. of days. | Rain on. | No. of days. | Rain on. | No. of days. | Rain on. | No. of days. | Rain on. | No. of days. |
| Midnight. | 2        |              |          |              |          |              |          |              | 16       |              | 4        |              | 1        |              |          |              |          |              |          | 3            |
| 1         | 2        |              |          |              |          |              |          |              | 18       |              | 4        |              | 1        |              |          |              |          |              |          | 1            |
| 2         | 2        |              |          |              |          |              |          |              | 17       |              | 4        |              | 1        |              |          |              |          |              |          | 2            |
| 3         | 1        |              |          |              |          |              |          |              | 20       |              | 3        |              |          |              |          |              |          |              |          | 12           |
| 4         | 1        |              |          |              |          |              |          |              | 18       |              | 3        |              |          |              |          |              |          |              |          | 12           |
| 5         |          |              |          |              |          |              |          |              | 17       |              | 4        |              | 1        |              |          |              |          |              |          | 4            |
| 6         | 2        |              |          |              |          |              |          |              | 15       |              | 7        |              | 1        |              | 1        |              |          |              |          |              |
| 7         |          |              |          |              | 1        |              | 1        |              | 14       |              | 8        |              | 1        |              | 1        |              |          |              |          |              |
| 8         | 2        |              |          |              |          |              |          |              | 10       |              | 7        |              | 4        |              | 2        |              |          |              |          | 1            |
| 9         | 3        |              |          |              |          |              |          |              | 10       |              | 7        |              | 3        |              | 3        |              |          |              |          |              |
| 10        | 4        |              |          |              |          |              |          |              | 10       |              | 5        |              | 5        |              | 2        |              |          |              |          |              |
| 11        | 3        |              |          |              |          |              |          |              | 8        |              | 7        |              | 4        |              | 4        |              |          |              |          |              |
| Noon.     | 7        |              |          |              |          |              |          |              | 7        |              | 3        |              | 6        |              | 3        |              |          |              |          |              |
| 1         | 2        | 1            |          | 1            |          | 1            |          |              | 6        |              | 2        |              | 7        |              | 6        |              |          |              |          |              |
| 2         | 5        |              |          | 1            |          | 1            |          |              | 3        |              | 3        |              | 10       |              | 3        |              |          |              |          |              |
| 3         | 2        |              |          | 1            |          | 1            |          |              | 3        |              | 4        |              | 11       |              | 4        |              |          |              |          |              |
| 4         |          |              |          | 2            |          |              |          |              | 5        |              | 7        |              | 9        |              | 3        |              |          |              |          |              |
| 5         | 1        |              |          | 1            |          |              |          |              | 9        |              | 5        |              | 4        |              | 4        |              |          |              |          | 2            |
| 6         | 2        |              |          | 1            |          |              |          |              | 14       |              | 4        |              | 3        |              | 2        |              |          |              |          |              |
| 7         | 2        |              |          |              |          |              |          |              | 13       |              | 5        |              | 3        |              | 2        |              | 1        |              |          |              |
| 8         | 2        |              |          |              |          |              | 1        |              | 13       |              | 5        |              | 2        |              | 2        |              | 1        |              |          |              |
| 9         | 2        |              |          |              |          |              | 1        |              | 14       |              | 5        |              | 2        |              | 1        |              | 1        |              |          |              |
| 10        | 2        |              |          |              |          |              | 1        |              | 14       |              | 5        |              | 2        |              | 1        |              | 1        |              |          |              |
| 11        | 2        |              |          |              |          |              | 1        |              | 14       |              | 4        |              | 2        |              | 1        |              |          |              |          | 2            |



